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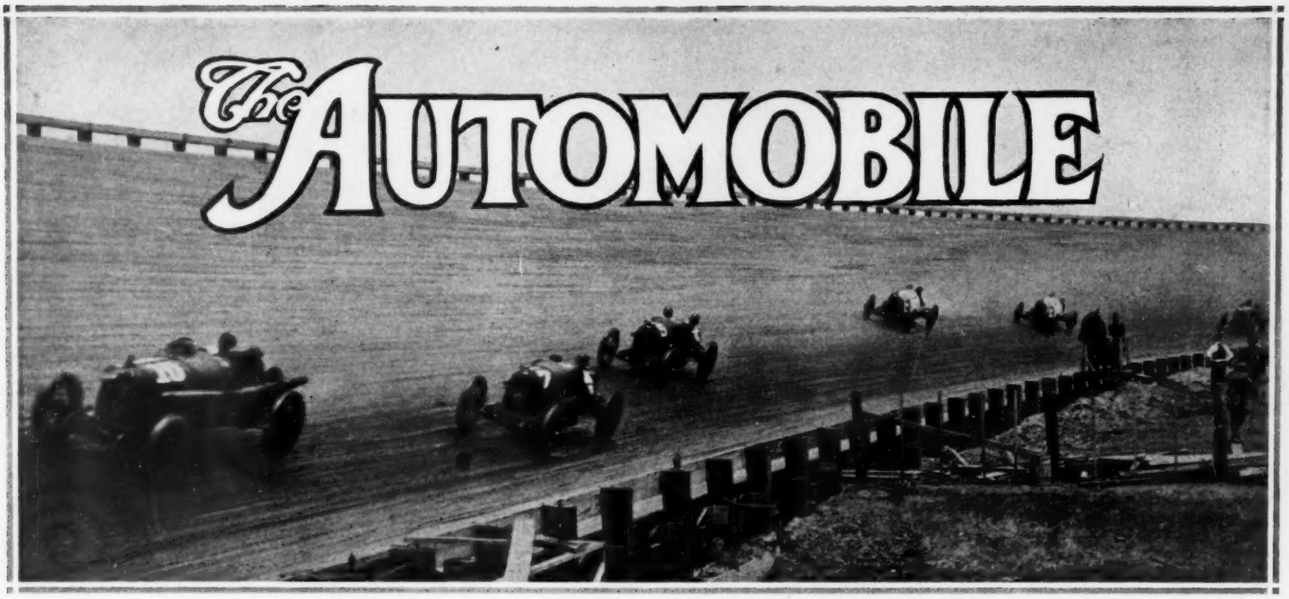
The AUTOMOBILE



Turning the banked curves at 100 miles an hour; a group of contestants at high speed

Resta in Peugeot Victorious

Averages 97.58 Miles Per Hour Over 500-Mile Course on Chicago's Board Saucer—First Ten Higher than 90 Miles Per Hour

CHICAGO SPEEDWAY, June 26—Lacking but 7½ min. of averaging 100 m.p.h. for 500 miles, on the new 2-mile board speedway here to-day, Dario Resta in the Peugeot car in which he finished second at Indianapolis, carried off $23,000 in cash prizes, and set a world's record for this distance on any speedway. This average might have been higher had he been forced to extend the Peugeot, in fact during three of the centuries out of the five hundred, the average was over 98 m.p.h., the highest average being on the second hundred mile where Resta put the mark at 99.4 m.p.h.

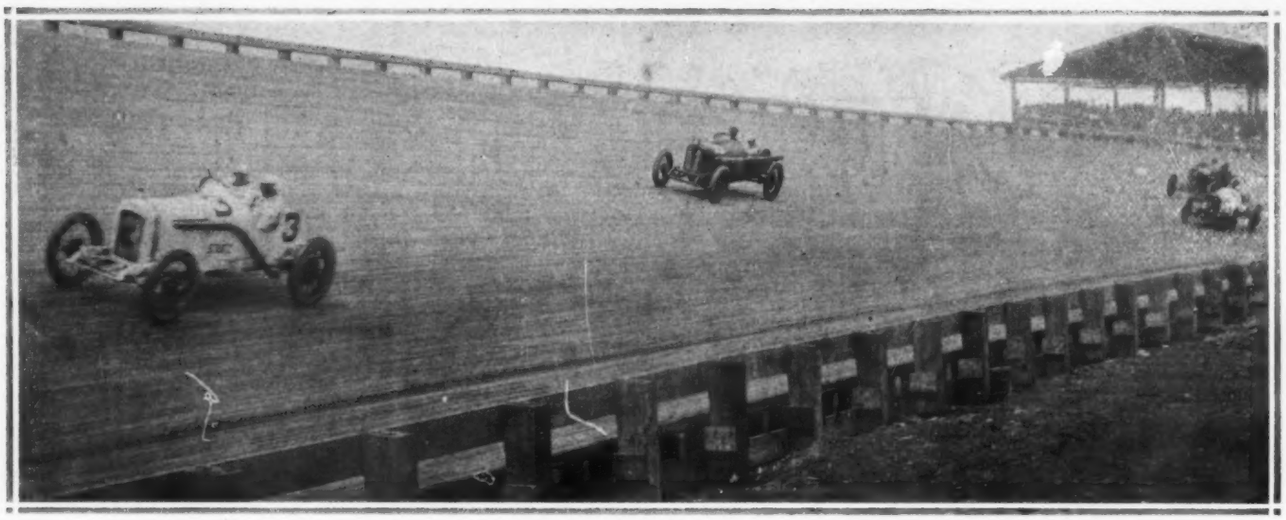
Believed 97 M.P.H. Would Win

A speed of 97.58 m.p.h. was not dreamed of previous to the start of the race. Resta himself believing that a pace of 97 m.p.h. would easily win. With this object in view he set out not to hurry himself during the first hour, when his average was 96.8 m.p.h. This proved too slow and he found himself in third position and 1½ min. behind Porporato in a Sunbeam who was setting the pace. This brought Resta to the realization of the fact that to win meant a higher speed than 97 m.p.h. and he started his second century with 100 m.p.h. as his objective. How close he came to this is shown by the timer tape which gives his average for the second hundred at 99.4 m.p.h. at which position he was leading with a little over a minute on the rest of the field. He slackened slightly on the third hundred placing his average at 98.3, but finishing this century with a lead of over 3 min. His fourth century was made at 98.4 m.p.h. at the end of which he had a lead of over 3½ min. He slackened off very considerably during the last hundred miles, when he had the race well in hand, his pace aver-

Resta in Peugeot Winner of the Chicago 500-mile Board Speedway Competition

RESULTS

Driver	Car	M.P.H.
Resta	Peugeot	97.58
Porporato	Sunbeam	96.5
Rickenbacher	Maxwell	96.1
E. Cooper	Stutz	94.9
Grant	Sunbeam	94.3
Anderson	Stutz	93.7
Chevrolet	Delage	92.8
Burman	Peugeot	92.2
Allev	Duesenburg	91.3
J. Cooper	Sebring	90.3



Anderson's Stutz leading Van Raalte s Sunbeam, showing the latter's tendency to go high on the bank

aging but 95 m.p.h. which was enough to let him win with a margin of 3 min. and 24 sec. over Porporato who was in second position with a Sunbeam.

Board Surface Makes Good

The average pace of 97.58 m.p.h. as compared with 89.84 average by DePalma at the Indianapolis speedway, gives some indication of what may be expected in the future on board tracks. Chicago's new board surface has made good to-day in a manner not anticipated by the most sanguine. Cord tires have also made good to-day in a manner that exceeds the expectations of those who saw them perform so remarkably at Indianapolis. Up to 100 m.p.h. these tires gave a good account of themselves but at speeds of over 100 m.p.h. the wear was such as to make changes necessary on the right rear every 15 or 20 min.

Battle from the Start

Resta had to battle with his rivals from the drop of the starter's flag until the race was half over before he was certain of a walk-over, and from that distance to the finish it was largely a procession on his part. The greatest speed of the race was during the first hundred miles when the 3 Stutz cars and Porporato's Sunbeam were setting a pace intended to eliminate Resta's fast Peugeot. An average lap by lap of 105 to 108 m.p.h. was being maintained by these leaders, and if it had not been for tire troubles during the first century a phenomenally high pace would have been maintained. Instead of drawing Resta out, as they had hoped, the wiley Italian stuck to his objective, 97 m.p.h. and watched his competitors one by one stop for tire troubles. Porporato led the field at the end of the first century gaining the distinction of being the first driver to win the $1,000 for leadership at this point. Cooper in the Stutz was second, and Wilcox in another Stutz was eliminated with a broken piston.

It was at this point that Resta's real race started, namely that of overtaking Porporato and Cooper and establishing a safe lead for himself, which he had accomplished before 120 miles were covered. At this point he leading Porporato by 6 sec. At 140 miles his lead was 25 sec. At 150 miles he had a lead of 49 sec. At 160 miles he had nearly 2 min. to his credit, and from this time to the finish he never lost the leadership, while the fight for second place was being steadily waged among Porporato in his Sunbeam, Rickenbacher in a Maxwell, and Earl Cooper with the Stutz at a speed which often went up to as much as 100 m.p.h.

Porporato Forces Pace

Porporato who finished in second position with an average of 96.5 m.p.h. was one of the drivers to greatly improve his chances after the Indianapolis race, where he failed to make a showing. He was but 3 min. and 24 sec. behind the leader at the finish, and his phenomenal performance during the first hundred miles constituted one of the most interesting phases of the race. It was his battle with the Stutzes during this opening century which was responsible for the high average of 99.2 m.p.h. irrespective of many stops for tire troubles as well as the disadvantage of starting with relatively cold motors, which could not be expected to show up as well in the opening century as in subsequent ones. Although leading at the first hundred, Porporato was in second place at 200 miles being more than 3 min. back of the leader; at 300 miles he was back in fourth place, Rickenbacher's Maxwell and Cooper's Stutz leading him by approximately a minute. He ran in fourth position to 350 miles when he got back in third place and was able to get in second position at 400 miles which position he maintained to the finish of the race with the narrow margin of 15 sec. From the time Porporato safely landed in second place at 400 miles, it was a neck-and-neck fight with Rickenbacher who was rapidly gaining on him at the finish. Porporato had a lead of less than a minute on Rickenbacher's Maxwell at 400 miles. He increased this to nearly 2 min. at 440 miles and at 460 miles he had a lead of nearly 3 min. This was cut to less than a minute at 480 and to 15 sec. at the finish.

Prize Winners

No.	Driver	Car	Prizes
1	Resta	Peugeot	$23,000
11	Porporato	Sunbeam	11,000
7	Rickenbacher	Maxwell	5,000
4	E. Cooper	Stutz	3,500
17	Grant	Sunbeam	3,000
3	Anderson	Stutz	2,000
12	Chevrolet	Delage	1,800
9	Burman	Peugeot	1,700
19	Alley	Deusenberg	1,600
23	J. Cooper	Sebring	1,400
	Total		$54,000

Stutz Set Fast Pace

Before the start the Stutz entry of 3 cars was looked upon to be a determining factor in the race and wide regret was expressed by Stutz followers when the first to finish was Cooper's in fourth place and the next Anderson's in sixth position. Wilcox

The last row passes the pits as Resta leads off the first lap

driving the third Stutz was eliminated on the ninetieth mile. From the start the three Stutzes set out to maintain a terrific pace, Wilcox being the pace setter as at Indianapolis. Tire troubles soon set in. The race started at 10.30 and exactly 17 min. later Cooper stopped to change a right rear on his Stutz; a minute later Anderson stopped his Stutz to change a right rear, leaving Wilcox and Resta averaging 104 m.p.h. to the lap. At 32 miles or exactly 19 min. after starting Resta stopped to change a right rear, allowing Wilcox to gain three-quarters of a lap, but his leadership was shortlived as he to had to stop to change a right rear after the race was running but 22 min. He took 30 sec. for the change but which was enough to restore the leadership to Resta.

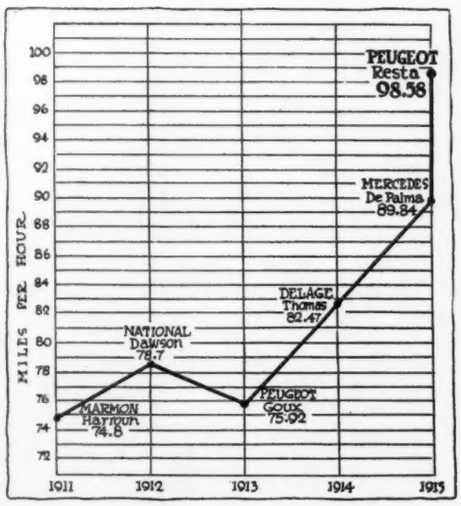
Resta's leadership was again surrendered when at 74 miles he stopped for another right rear, with Wilcox but a lap behind him, and Anderson closely following. At this point it looked as if three or four stood even chances for the $1,000 prize for leadership at the end of the first hundred miles, but stops for tires entirely changed the aspect of affairs, and Porporato carried off the wished for gold.

Rickenbacher's performance in bringing the Maxwell into third position with an average speed of 96.1 m.p.h. was unexpected. He was not a serious contender during the first hundred miles running in eleventh place at 60 miles. He cut this to ninth position at 100 miles. It was in the second century that he established himself by cutting to eighth place at 120, to sixth place at 140, to fifth place at 160, to fourth place at 180, and to third at 220. He dropped back to fourth place for a short time only to later regain third which he held for the last hundred miles.

Earl Cooper brought his Stutz into fourth position finishing with an average of 94.4 m.p.h. Cooper drove a remarkably consistent race from start to finish only for one period during the entire race did he get further back than fourth place, this being between 220 and 280 miles when he was running in fifth and seventh positions. He was soon in third place, but at 350 miles was in fifth which he held until near the finish.

Harry Grant finished in fifth position. To bring his six-cylinder Sunbeam home in that place was considered impossible both by Grant and the others and to bring it home as he did without making a stop was wonderful indeed. The car is old and has been raced many seasons, its speed quite high, but its stamina for a long grind always questioned. Grant turned the 2-mile track in 1 min. 15 sec. to 1 min. 16 sec. as steadily as if some mechanical device were in control. When Grant crossed the tape on his last lap his 7-gallon oil tank was empty, his gasoline was exhausted for he coasted over the line, and many parts of his car were about to give way. The exhaust pipe was broken and the rear half almost dropping off and many other unimportant parts were in equally bad shape. But Grant has been having hard luck with this car for two seasons and in each race started, some minor trouble would develop and put him out of the running. The single set of tires Grant used were Silvertown cords and the front set showed practically no wear, while the rears had only a small portion of the tread ground off. Grant was the only driver to finish the 500 miles without making a stop, but he was not alone in bringing home a car without making a tire change. Five others share this honor with him, Alley, J. Cooper in a Sebring, Orr in a Maxwell, and Mulford and Babcock both of whom finished but not in the first ten.

The five other cars to finish were: Anderson's Stutz, at 93.7 m.p.h.; Chevrolet, Delage at 92.8 m.p.h.; Burman, Peugeot at 92.2 m.p.h.; Alley, Duesenberg at 91.3 m.p.h., and J. Cooper, Sebring at 90.3 m.p.h.



Speed chart showing big gain in miles per hour above previous events

Burman Changes a Piston

Of those finishing in the money there is another whom we must acknowledge as displaying gameness of an unusual sort, this being Burman. Thirty minute before the official time for starting Burman discovered a piston had seized momentarily during his last trial lap and this meant he was out of the race unless Referee Vissering would grant him time practically to dismantle his motor. The drivers and officials expressed their willingness to have the start delayed until 10.30 to allow Burman to replace the burned piston and clean the scored cylinder. With a trio of

Tabulation of Times at Important Intervals in the 500-Mile Race at Chicago

No.	Car	Driver	Position	Miles: 40	Position	100	Position	200	Position	300	Position	400	Position	460	Position	480	Position	500	M.P.H.
1	Peugeot	Resta	1	23:59:85	3	1:01:58	3	2:02:17	1	3:03:19	1	4:04:49	1	4:41:12	1	4:53:28	1	5:07:26	97.58
11	Sunbeam	Porporato	7	23:21:65	1	1:00:28	1	2:05:23	3	3:08:25	4	4:08:29	2	4:44:33	2	4:58:43	2	5:10:50:45	96.5
7	Maxwell	Rickenbacher	5	24:23:80	6	1:04:55	9	2:05:30	4	3:07:51	2	4:09:18	3	4:47:22	3	4:59:32	3	5:11:65:23	96.1
4	Stutz	Cooper	4	24:19:15	4	1:01:06	2	2:03:34	2	3:08:19	3	4:14:45	5	4:52:04	5	5:03:53	4	5:15:59:15	94.9
17	Sunbeam	Grant	12	24:44:00	10	1:04:56	10	2:06:44	6	3:09:38	5	4:12:02	4	4:51:22	4	5:04:04	5	5:18:11:58	94.3
3	Stutz	Anderson	3	24:32:77	8	1:02:53	6	2:08:51	9	3:12:38	7	4:16:24	6	4:54:20	6	5:06:29	6	5:20:09:86	93.7
12	Delage	Chevrolet	11	24:43:00	9	1:03:19	7	2:06:02	5	3:11:06	6	4:16:27	7	4:57:08	7	5:09:44	7	5:23:05:67	92.8
9	Peugeot	Burman	9	24:23:23	5	1:02:37	5	2:13:27	11	3:20:29	10	4:21:51	8	4:58:26	8	5:12:52	8	5:25:12:61	92.2
19	Duesenberg	Alley	21	33:27:84	19	1:12:12	17	2:18:16	15	3:20:39	10	4:24:19	9	5:03:08	9	5:15:35	9	5:28:33:88	91.3
23	Sebring	J. Cooper	15	25:57:04	14	1:06:04	12	2:14:33	13	3:21:13	11	4:27:06	10	5:05:58	10	5:18:51	10	5:32:10:42	90.3
22	Peugeot	Babcock	17	26:43:05	15	1:08:52	15	2:16:15	14	3:26:14	12	4:33:22	12	5:12:51	11	5:26:08	11	5:39:19:28	88.4
10	Sunbeam	Van Raalte	6	23:22:43	2	1:02:29	4	2:06:55	7	3:19:01	8	4:32:01	11	5:21:30	12	5:36:09	12	5:59:59:85	83.4
5	Maxwell	Carlson	10	28:35:43	18	1:08:21	14	2:12:03	10	3:53:25	15	5:01:36	14	5:41:29	13	5:55:58		Flagged.	
27	Maxwell	Orr	14	25:18:83	13	1:05:53	11	2:20:59	16	3:38:47	13	4:56:39	13	5:43:28	14	5:59:12		Flagged.	
30	Mulford	Mulford	18	27:57:62	17	1:12:00	16	2:25:18	17	3:39:40	14	4:59:39	15	5:47:18		Flagged.			
21	Duesenberg	Haupt	13	24:49:09	11	1:25:00	18	3:51:38	18	Out 294th mile, clutch trouble.									
15	Duesenberg	O'Donnell	8	24:28:58	7	1:04:48	8	2:07:16	8	Out 280th mile, connecting rod bearing failed.									
31	Sunbeam	Limberg	16	26:48:45	16	1:07:39	13	2:13:39	Out	220th mile, connecting rod bearing failed.									
2	Stutz	Wilcox	2	25:05:48	12	Out 90th mile, broken piston.													
20	Mercer	Henning	19	34:11:20	Out	42nd mile, oil on plugs.													
24	Ogren	Chandler	Out	24th mile,	broken bevel pinion housing.														

mechanics Burman set to work and with lightning speed dismantled the motor, cleaned the cylinder by lapping in a dummy piston with coarse emery, replaced the injured piston and was ready on the starting line at 10.30. It was remarkably fast work and efficient too, as it proved when Burman finished in eighth place.

Porporato Breathed Smoke

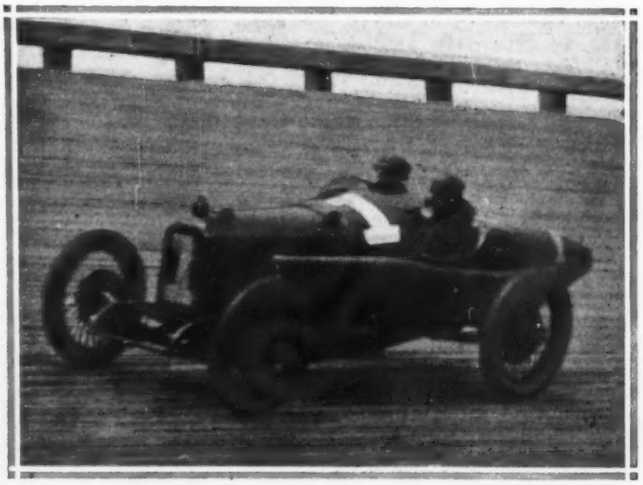
Those knowing the drivers intimately, realize the astonishing results. While it was not unexpected that Resta would win, for he had the fastest car in the race, it was unlooked for to see Porporato, and Rickenbacker finish as they did, since these contestants were expected to be displaced by the Stutzes. Porporato was a happy place winner, for before the race he expressed himself as believing his car would not finish. "It cannot stand the terrible grind which I expect will be over 95 m.p.h." But Porporato gained hope when he was told he was running two laps behind Resta for about 50 miles. And atop of it all Porporato drove through the entire 500 miles in an atmosphere of smoke. This was caused by discharges from the breather pipe and leaks about the exhaust pipe, the smoke being forced through the driver's compartment by an air draught. When asked how he possibly finished after breathing smoke for 5 hours he answered through his interpreter, "Periodically I would stick my head to one side and get a breath of fresh air and this would be enough for one-quarter of a lap."

Other astonishing results were made. It was thought by everyone, that there would be an unusually large number of failures in the early part of the race because of the fast pace anticipated. Many predicted the number of cars to finish would be insufficient to take all the prize money. The first 100 miles showed three cars withdrawn. These were the Ogren driven by Chandler which went out after 20 miles with a broken driving pinion housing, the Mercer special driven by Hanning went out with ignition trouble caused by too loose pistons and the Stutz driven by Wilcox withdrawing with a broken piston. This car mortality was very low compared with Indianapolis where five cars went out early in the race. Between 100 and 200 miles the remaining twenty-one cars all remained in the race, but between 200 and 300 two more fell by the wayside, these being the Sunbeam driven by Limberg which had burned out a bearing and the Duesenberg with Haupt up which went out because the clutch could not be operated.

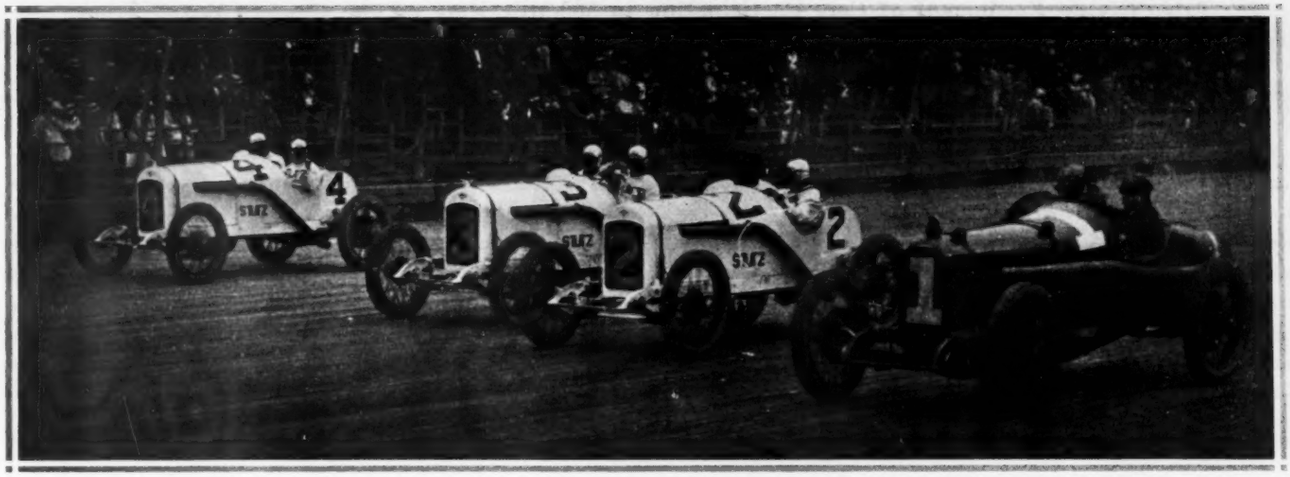
Six failures in twenty-one starters is a very good record and on a percentage basis equals about 29 per cent, whereas at Indianapolis half the field, or eleven cars, were withdrawn before the race was finished.

Track Design Helped Speed

That few cars dropped out and that the time of the first ten was better than DePalma's Indianapolis record was possible only because of the design of the track. Had the cars and drivers been capable of withstanding a speed of 110 m.p.h. the track would have permitted it, for its turns are



Resta traveling at high speed around the course



Front row favorites. Resta's Peugeot and the three Stutz who were expected to make the pace

so shaped as to make steering an act requiring little effort and, if properly negotiated, reduce tire wear to a minimum. Most of the drivers found that high riding, about 8 ft. from the top rail was the tire saving zone while others who traveled low and scraped their wheels across the wood surface made the greater number of tire changes. After 100 miles of running a black band about 10 ft. wide formed from exhaust smoke, oil, water and other drippings from the cars encircled the track and it was at a point just outside this band that tires seemed to ride with least wear. Grant found this out early in the race and while Porporato had an idea that high riding would do the trick, he rode too high and entered and left the turns with too much of a swing. Grant attributed his tire record to three things, the tires, the method of driving and the weight distribution of his car which he redesigned in this respect.

There were many conditions present at Chicago's race which parallel as many at Indianapolis. In the first place the race to-day should have been run last Saturday but rain caused a postponement. One hour before the start, black clouds hovered overhead and it looked as if a storm was approaching, as also at Indianapolis. Even at the start a heavy mist dropped over the track so that grandstand spectators could not see the bleachers opposite, which is possible in fair weather. It was an hour after the start that Old Sol poked his head from behind a cloud and beat down with all his calorific value on the wood saucer. He showed out just in time to brighten Porporato when he crossed the tape a leader at 100 miles at 99.8 m.p.h. and a winner of the $1,000 prize offered for the performance.

Cars Went Through Mist

The twenty-one cars starting plowed through the heavy mist with Resta leading a 100-mile pace. He had to lead for it was expected of him and he was being hounded by the Stutzes. But Resta drove beautifully and suffered no trouble like he did at Indianapolis. He made five stops, three for a right rear tire and two for supplies of fuel and oil. His last stop was made while he was leading Porporato by three laps and evidently Resta remembered the fate of others who lost a race because the car needed fuel on the last lap. Resta has pitmen of par excellence; men who practiced for weeks before, in changing tires, filling the tanks, etc. Resta stood calmly by each time he stopped and even on his last halt he waited patiently for assistance instead of getting excited. Resta did not have to fear Porporato for to gain three laps was impossible at this time and the next nearest man was Rickenbacher who was too far behind even to be considered

General view of the activities at the track during the 500-mile race at the Chicago speedway

Table Giving Equipment of Cars Participating in 500-Mile Race on the Chicago Board Track

Car	No.	Driver	Mechanician	Cylinders	Bore	Stroke	Displacement	Spark Plug	Carbureter	Mag neto	Tires	SIZE		Wheels	Motometer	Wheelbase	Weight
												Rear	Front				
Peugeot	1	Resta	McCarty	4	3.62	6.67	276.0	K.L.G.	Zenith	Bosch	Silvertown	35x5	34x4½	R.W.	Boyce	109	2400
Stutz	2	Wilcox	Scott	4	3.812	6.50	296.8	Bosch	Stromberg	Bosch	Silvertown	33x5	33x4½	Houk	Boyce	102	2404
Stutz	3	Anderson	Rooney	4	3.812	6.50	296.8	Bosch	Stromberg	Bosch	Silvertown	33x5	33x4½	Houk	Boyce	102	2340
Stutz	4	Cooper	Dutton	4	3.812	6.50	296.8	Bosch	Stromberg	Bosch	Silvertown	33x5	33x4½	Houk	Boyce	102	2385
Maxwell	5	Carlson	Franzen	4	3.75	6.75	298.2	Bosch	Master	Bosch	Silvertown	35x5	34x4½	Houk	Boyce	105	2202
Maxwell	7	Rickenbacher	Schroder	4	3.75	6.75	298.2	Bosch	Zenith	Bosch	Silvertown	35x5	34x4½	Houk	Boyce	105	2267
Peugeot	9	Burman	Gable	4	3.65	7.10	296.0	Bosch	Master	Bosch	Silvertown	34x4½	33x4½	R.W.	Boyce	105	2350
Sunbeam	10	Van Raalte	Copple	4	3.70	6.30	274.0	K.L.G.	Zenith	Bosch	Silv. (R) Palmer (F)	880x120 mm.	820x120 mm.	R.W.	Boyce	112	2244
Sunbeam	11	Porporato	Romco	4	3.70	6.30	274.0	K.L.G.	Zenith	Bosch	Silv. (R) Palmer (F)	880x120 mm.	820x120 mm.	R.W.	Boyce	112	2300
Delage	12	Chevrolet	Phellips	4	3.662	7.09	298.68	Bosch	Claudel	Bosch	Silvertown	33x4½	33x4½	R.W.	Boyce	110	2350
Duesenberg	15	O'Donnell	P. Henderson	4	3.98	6.00	299.0	Bosch	Schebler	Bosch	Silvertown	33x5	33x4½	R.W.	Boyce	106	2170
Sunbeam	17	Grant	Moore	6	3.26	5.89	274.9	K.L.G.	Master	Bosch	Silvertown	35x5	34x4½	R.W.	Boyce	110	2480
Duesenberg	19	Alley	J. Henderson	4	3.98	6.00	299.0	Rajah	Master	Bosch	Silvertown	33x4½	33x4½	R.W.	Boyce	106	2120
Mercer	20	Henning	Davis	4	4.75	6.75	298.2	Bosch	Rayfield	Bosch	Silvertown	33x4½	33x4½	R.W.	Boyce	110	2400
Duesenberg	21	Haupt	Johnson	4	3.98	6.00	299.0	Bosch	Schebler	Bosch	Silvertown	33x5	33x4½	R.W.	Boyce	106	2160
Peugeot	22	Babcock	Palloth	4	3.07	6.141	186.0	K.L.G.	Claudel	Bosch	Silvertown	34x4½	33x4½	R.W.	Boyce	104	2100
Sebring	23	J. Cooper	Peio	4	3.98	6.00	299.0	Bosch & Rajah	Master	Bosch	Silvertown	33x5	32x4½	R.W.	Boyce	102	2499
Ogren	24	Chandler	Liphardt	4	3.98	6.00	299.0	Rajah	Rayfield	Bosch	Silvertown	33x4½	32x4	Houk	Boyce	106	2499
Maxwell	27	Orr	Stafford	4	3.75	6.75	298.2	Rajah	Master	Bosch	Silvertown	35x5	34x4½	Houk	Boyce	105	2200
Mulford	30	Mulford	Stevens	4	3.687	7.00	299.0	Rajah	Zenith	Bosch	Silvertown	33x4½	32x4	R.W.	Boyce	102	2496
Sunbeam	31	Limberg	Lorgehamp	6	3.26	5.89	274.9	K.L.G.	Master	Bosch	Silvertown	35x5	34x4½	R.W.	Boyce	116	2497

a more than barely possible snatcher of Resta's position.

It seems odd that the second and third finishers also should have made five stops each. Porporato halted four times for tires and once for supplies. Three stops for tire changes were made within 48 min. The first at 92 miles, the second at 150 and the third at 158 miles.

Rickenbacher's five stops were divided as Resta's, three for tires and two for supplies. As with Resta, Rickenbacher halted early in the race—once at 26 miles, but his last stop was made at 341 miles.

At the start of the race Resta was worried, and he had reason to be, because every driver in the race looked to him as the man to "get." All sorts of plans were afoot and it appears that the three Stutzes attempted to arrange themselves in a row directly behind Resta so that at a certain moment the picked one would shoot out in the lead. Wilcox did the trick and jockeyed with Resta for about four laps and then had to stop for a tire change. However, Resta stopped a few laps later for a tire, and this allowed Wilcox to come around and take the lead, with Resta just starting out from the pits. Meanwhile Cooper and Anderson were fighting hard to get Resta's lead and Porporato was undecided as to what to do. At 50 miles Resta was leading by only a small margin and a few knew where Porporato was running. Between 50 and 100 miles Resta held the lead practically all the time, but Porporato unknowingly shot ahead at 100, taking the $1,000 prize and the record for the distance.

From 100 miles onward Resta had his own way. He had from two to ten laps on the majority of the field and only two Stutzes and Porporato to contend with as the others did not care to break up in an effort to get further in front. These in the ruck relied upon the failure of the leaders to set them ahead. It was Resta, Porporato, Rickenbacher and Cooper who were doing the fast work in front. Porporato did not know what position he held because the scoring was not up to standard, but he was so enthusiastic because the car was still on the course that he was content to keep going and merely finish. At 200 miles Resta was traveling slightly under 98 miles per hour, taking the turns rather high and coming around so often that spectators started to lose track of the number of laps he was ahead of the others. Strange as it may seem, it looked as if Porporato was traveling faster than Resta, probably because the former was driving close to the wall on the straightaway and offered better comparison with a fixed object. However, Porporato was running in third place about 3 min. behind Resta and following him was Cooper, only one lap behind, and Rickenbacher, almost on even terms with Porporato.

Four Drivers Furnish Thrills

These four drivers were furnishing the spectators with a demonstration of the speed capabilities of the track and at 300 miles the order was changed with Rickenbacher in second place 5 min., or nearly 4 laps, behind Resta. Cooper was third and Porporato was fourth. It was after the 300 mile mark that Porporato began to wake up and at 400 he was in second place. These four men ran the last 100 miles in practically the same order they showed at 400, but each worked hard to gain a little, all succeeding, as the times show.

When the first ten men had finished there still were five cars on the track and each one wanted to finish.

In point of attendance the speedway officials were satisfied and an official count showed 80,000 people had paid for watching the first 500-mile race in Chicago. Many of the spectators did not arrive until a few minutes before the start owing to the fact that the Illinois Central Railroad was blocked for more than three miles because of a wreck. This was the only steam road running special trains to the speedway and its service was paralized completely for more than two hours. The roads leading to the track were frightfully crowded with pedestrians and automobiles, not a few cars being forced into the ditch and pulled out by teams.

Race Motors Behave Marvelously

Anticipated Failures Due to High Speeds Do Not Occur—Cars Well Prepared After Indianapolis Race

By A. Ludlow Clayden

CHICAGO SPEEDWAY, June 26—Everyone, whether layman or expert, was agreed that the extremely high speed capability of the Chicago speedway would provoke motor trouble, and prophets were not wanting to predict that the speed made at Indianapolis would not be beaten; simply because the cars would not stand up under treatment any more severe. Well, the events of today prove that the prophets were wrong as they have often been before in racing predictions.

Of the cars which finished well up in the list the first eight had nothing done to their motors throughout the race. Burman, the ninth man, changed a couple of spark plugs on two occasions and the tenth man never touched the motor at all. Thus out of ten cars all running 500 miles at a speed in excess of 90 miles an hour, a total distance of 5,000 car-miles, all that was done to the ten engines was the changing of four spark plugs.

Let us look at the total of reliability which this represents.

Forty ultra-light pistons stood up.

One hundred and forty valves and valve springs stood up.

Ten magnetos supplied at least 18,000,000 sparks.

Not more than sixty spark plugs took this discharge and stood up (probably those which Burman changed were missing because of oil).

Eleven carbureters gave a steady supply of proper gas.

Oil in proper quantities reached the 1,000 moving parts of the ten motors.

And, this is the main point of the whole demonstration:

Only two modern design cars suffered broken parts, despite such a thrashing as a bunch of racing machines has never before received.

Lessons of Indianapolis

Now, it is not very long since the Indianapolis 500-mile race showed a very different state of affairs, so there can be no question that the lessons learned in the Hoosier classic have been taken to heart, and that the time interval has been sufficient to enable the owners of the competing vehicles to make good use of their experiences.

At Indianapolis two things stood out prominently as troubles, spark plugs and materials. Both these in turn reflect to lubrication for the spark plugs which failed to spark mostly did so because of too much oil, while the materials which, in the forms of pistons or connecting rods, could not stand the stress mostly failed because absence of oil at the right place produced too much friction and so too much heat.

This was not always so for some of the mechanical breakdowns at Indianapolis were caused by too weak a design, such as the use of too fine a fillet between the head and the wall of an aluminum-alloy piston. Such things as this have been changed, the oil pressures have been adjusted, the piston clearances have been modified so as to give the best compromise of freedom and oil tightness, in one or two cases compressions have been altered and valve spring strengths have been increased a little on some of the cars, but nothing radical has been done.

Racers Are Improved

One might sum up the whole situation by saying that Indianapolis showed us a bunch of fine cars either altogether new or partly new. Cars prepared with the utmost care but not tried out under the only really severe test, that of a long race.

At Chicago we have now seen the same cars freed from their minor faults, with the bugs removed. They are to the cars of 4 weeks ago as the stock product of a good manufacturer is to his last experimental model and this record-breaking race in Chicago is the finest testimony that the world of motoring has ever had to the importance of little things. One thing and one thing only made the motors' task a little easier and this was a general use of slightly higher gear ratios, but this was offset or even more than nullified by the greater speed and the much higher air temperature.

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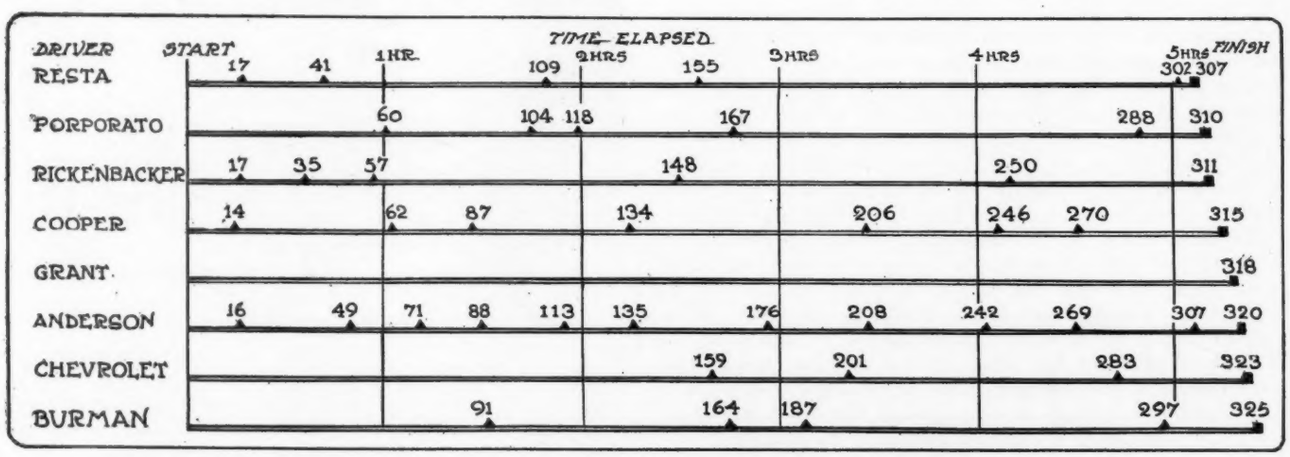

Chart showing the time in minutes from start when stops were made and the number of stops made by each car

A corps of Belgian armored cars going into action in an attack on a village in northern France

Belgian Armored Cars Most Efficient

Organized into Corps of Two Sections Each—Observation, Ammunition and Supply Cars, Cyclists and Motorcyclists in Each Unit

By W. F. Bradley
Special Representative of THE AUTOMOBILE, *with the Allied Armies in France*

IT is a somewhat curious fact that when the European war broke out the application of the automobile to warfare was decidedly inferior to the industrial and commercial organization of the self-propelled vehicle. Because staff officers made use of cars in place of horses, and because the aeroplane industry had been absorbed by the military authorities, it was popularly supposed that everything worth knowing about military motoring was possessed by the army authorities. As a matter of fact, military officers in all countries are the most conservative of beings. During the 8 months the war has been in progress more prejudices have been scattered to the winds, more practical knowledge has been gained and more progress has been made in the application of the automobile to military operations than in the 8 years preceding August 1, 1914.

Before the War

Germany, with her wonderfully efficient war machine, had not foreseen the full scope of the automobile in a great war. France had enough imagination to see that gasoline must replace oats in the task of carrying food and ammunition to the men in the front line. England possessed the finest fleet of commercial vehicles the world has ever seen and a war office which did not actually own more than a score of trucks when it was decided to send an army across the Channel. Belgium was snug and smug in her neutrality and had not even taken the trouble to consider in what way her motor industry could be of use to her army.

It is thus all the more to the credit of the plucky little nation that she should at the present time have the most carefully developed and the most efficient fighting automobile corps to be found in Europe. Even to the non-military mind it is obvious that the best use of the armored automobile is not as an individual machine attached to an infantry battalion or a cavalry regiment. To carry out really important work the armored automobiles must form a homogeneous and self-contained corps capable of operations on a really important scale. Such a corps, as it exists at the present time in the Belgian army, comprises ten cars fitted with cannon and machine gun and protected by armor plating, three officers' armor plated observation cars, one automobile workshop, two ammunition cars, three supply cars with gasoline, tires, oil

One of the Belgian armored cars as it appears on the road

and mechanical spares, and one automobile ambulance. In addition the corps has attached to it 100 cyclists and twelve motorcyclists.

A corps of this nature is divided into two sections, each comprising five armored cars, one officers' observation car, one ammunition car, two supply cars, fifty cyclists and six motorcyclists. The third observation car is used by the corps commander whether the two sections are working together or separately, while the repair car and the ambulance are common to the two sections. There is also an ordinary touring car used for despatch carrying and general work. The twenty-one cars forming the armored corps carry about 100 men, thus with the cyclists and motorcyclists making a total of more than 200 officers and men.

Each Man a Specialist

The staffs are picked with special care, every man being a specialist in his particular task. Every driver has had long experience on the road; the gunners are the best the army can provide; the men on the repair car can be relied on to make good anything short of a complete smash; there is an expert electrician for the electric lighting equipments; every motorcyclist can do running repairs and the cyclists comprise many professional road racers.

The corps has been organized and the cars designed and produced by Belgian automobilists of long experience, in collaboration with army officers. In this work the automobile engineer played a much more important rôle than the military expert, although it is obvious that the best results could only be obtained by a reasonable co-operation between an army man convinced of the utility of the automobile and an expert automobile engineer knowing what features to emphasize and what mistakes to avoid in order to get the most efficient service. To give complete credit, it should be mentioned that the artillery officer had to find a place on the expert committee, his task being to design the mounting of the guns and the armor plating on the cars.

Two makes of cars are used, the majority being 20 horsepower Mors, with Knight motor, and the others 18 horsepower Peugeots with four-cylinder, poppet-valve motors. The Peugeot cylinder dimensions are 3.7 by 6.3 inches, and the Mors bore and stroke are 3.9 by 5.5 inches. The two makes of cars are practically equal in speed and weight carrying capacity. They are all fitted with wire wheels carrying tires of 880 by 120 millimeters, the armored cars having twin wheels at the rear, and all the others have singles back and front. By this arrangement only one size wheel and one size tire is made use of in the entire corps, thus simplifying the carrying of supplies.

Every Detail Complete

No detail in the design and fitting up of the cars has been overlooked. The Mors armored cars have a single compartment built of 5 millimeter steel plate capable of resisting a rifle bullet fired at comparatively short range. A partial roof is fitted over the head of the driver, but is capable of being hinged forward so as to give easier movement within the body. There is no door, the men climbing in over the sides. The gun is mounted on a steel platform at the rear, its base swinging round on the platform, so that it is possible to fire ahead, astern, to left, or to right. One of the distinctive features of these cars is the use of the ordinary machine gun taking the rifle cartridge, and also of a cannon of practically 40 millimeter bore. The quick firer is mounted immediately above the cannon, in such a way that the gunner can use either one or the other at will, but in addition the rapid firing gun can be unshipped, fastened in supports on the side of the car and used in one direction while the bigger gun is firing in another direction.

The driver is placed as low as possible, with a sloping roof over his head, the hinged screen within this roof being

Above—Belgian armored car which has received its colors prior to leaving for the front

Below—Rear view of Belgian armored car. Note cannon and quick-firer above it; also tool chest at rear with axe and spade fastened at the side

capable of being placed at any angle so as to give a more or less clear view of the road. When closed down entirely, the driver has a view ahead through an eye hole only. There is a small shuttered opening on the two sides of the car, level with the heads of the driver and his assistant, and on the outside of these a mirror enabling a view to be obtained of what is happening immediately to the rear. Although there is but one steering wheel and one set of controls, there are two sets of clutch and brake pedals, the auxiliary set being in front of the reserve driver. As the switch is also centrally located, it is possible for the relief man to stop the car if the man at the wheel should be shot.

Protection of the motor comprises a fixed steel plate in front of and around the sides of the radiator, and steel plates received in grooves, on each side of the hood. The top of the hood is not protected. The steel guard in front of the

radiator has six rectangular openings cut in it, with a steel plate carried in front of the opening, there being a gap of about an inch and a half between this plate and the main surface. In addition there is a wind scoop at the top and bottom of the radiator guard. Two ventilator cowls are fitted on the top of the hood to help carry away the hot air from the motor. It has been found that this design gives adequate cooling, while protecting the motor without interfering with accessibility. Naturally a pump and ventilator fan are carried. In order to attend to magneto, carbureter or valves it is only necessary to lift out the sliding side plates and raise the hood in the usual way. Gasoline and oil are carried in the cowl, and thus fully protected against shot. The body stops short just a little ahead of the rear axle, leaving a space at the rear for a locker divided into six compartments for tools and spares. Other spares are strapped to the top of this locker, while on the sides are an axe, spade, saw and hammer, and on one side of the frame member, partly hidden under the body overhang, there is a pick and big shovel. On the right-hand side of the body there is a spare wheel carrier.

Lighting System Complete

Lighting equipment comprises a dynamo under the floorboards, supplying current to lamps within the car, to the headlights, and to the side lamps. The headlights are, however, also fitted up for acetylene, the generator being mounted on the left hand side of the body, just to the rear of the hood. The side lamps have gasoline burners in addition to the electric bulbs. It is practically impossible for the cars to be held up for lack of light. If the electric headlights fail the bulbs are taken out and the acetylene generator put into action. If there is no electric current, the gasoline side lamps can be used. It is because gasoline is always carried on the car that it has been preferred to kerosene or oil. Each car carries four men—two gunners, a driver and a reserve driver.

The Observation Car

One of the most interesting units of the section is the observation car. This is an armor-plated car with the body divided into three compartments. In the first compartment are the driver and his assistant, their protection against fire being practically the same as that of the men in the fighting cars. Back of the driver's cab is a small armor-plated compartment just big enough for two men. It has a conning tower in the roof, the sides of the tower being hinged in five or six sections so that one section only can be used if necessary. It is from this car that the commanding officer and his lieutenant command the operations. He makes use of a periscope in the conning tower, and has at hand maps, compass and other instruments. His compartment is fitted up with a seat for two, a folding table, and a series of lockers under the seat. The rear portion of the car is made to carry four men, but is more often used for transporting officers' kit. The entrance is at the rear; this portion of the body is not armor plated.

A Motor Workshop

Although the motor workshop is not as complete as the traveling shops attached to the big motor convoys, it is a really excellent example of a repair department capable of keeping pace on the road with comparatively fast machines. Unlike the convoy workshops, the possibility of overhauling a gearbox or a rear axle has not to be considered. The automobile has a van type body, fully opening at the rear. The equipment comprises a pedal-operated drilling machine, a forge, a heavy vise, anvil, complete sets of taps and dies and a very complete selection of hand tools. On one side of the car is a stout workbench, folding up against the body when not in use, and the tool chests are stout wood lockers fitting all around the car when the vehicle is in motion, but capable of being taken out and placed on the ground so that the top forms a convenient workbench.

There are no special features about the ammunition vans. The supply cars are distinctive, for the van type bodies are divided internally into sections to receive the 6-gallon circular

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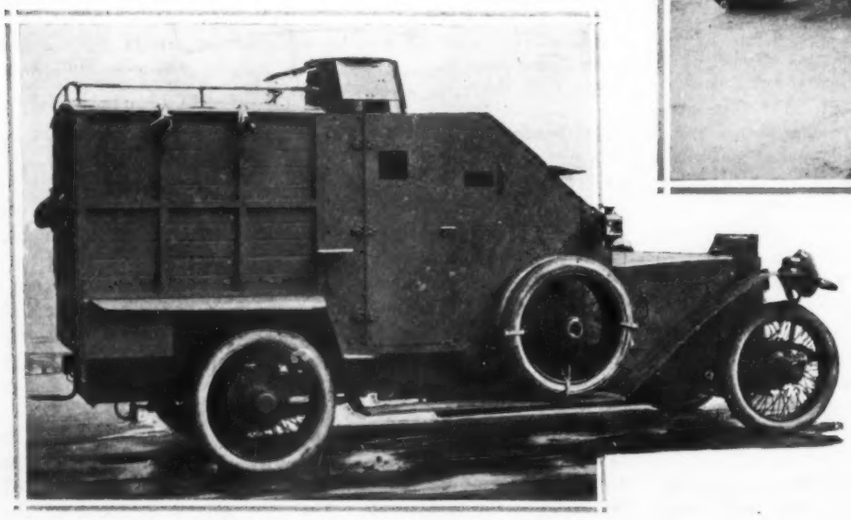
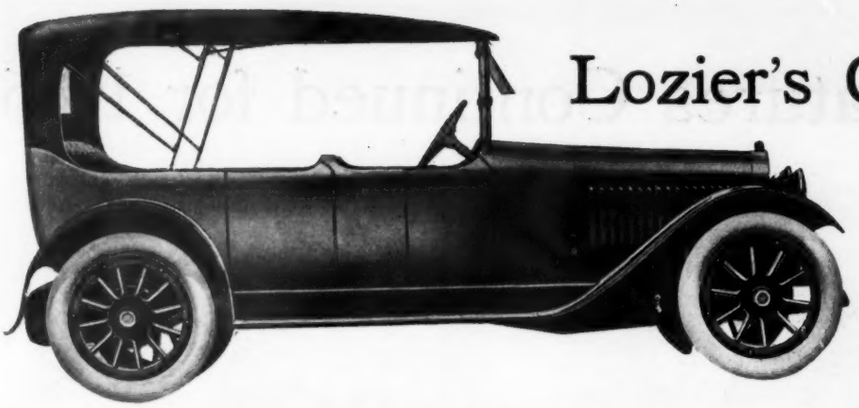


Above—One of a corps of Belgian armored cars reconnoitering on a road in the north of France. Note underslung rear springs and dual tires

Below — Officers' observation with periscope tower attached to a Belgian armored car corps. Note that only the forward portion is armor plated



Lozier's Car a Twelve

Former Manufacturer Breaks Retirement with Announcement of H.A.L. Car—Cylinders in Blocks of Six at 60 Degrees

Harry Lozier's new car to be known as H. A. L.

DETROIT, MICH., June 26—Harry A. Lozier's new car is to be a twelve-cylinder machine, selling at $1,750 either as a two-passenger roadster or seven-passenger touring car. The name selected temporarily is H. A. L., and this may or may not be adopted permanently. Details as to the personnel of the company, which has been organized by Mr. Lozier to market the new twelve in Cleveland, are still withheld.

Since his retirement as the head of the former Lozier Motor Co. in 1912, Mr. Lozier has been carefully studying conditions in the industry, and has reflected some of his ideas of latest construction and present development in the H. A. L.

The motor is 3 by 4½ in., giving it a rating of about 43.2 hp. S. A. E., and piston displacement of 381.6 cu. in.

The motor is a Cleveland product and of a design that has previously been brought out in types of a less number of cylinders. The cylinders are arranged in V fashion, at 60 deg., with all six of each side cast in a block. The valves are overhead and seated in the removable head which comes off as a unit for each block. The valve rods run up to the rockers in the V, which, due to the overhead-valve construction, permitting of the exhaust manifolds running on the outer side of the cylinder blocks, is free of all apparatus with the exception of the carbureter, intake manifolds, water connections and ignition distributer. This makes a very accessible design, particularly as there is a special means at the top of the cylinders for the adjustment of the valve tappets. The valve parts are inclosed completely.

Cylinders Are Offset

In the connection of the rods to the crankshaft, the cylinders are offset enough so that each two rods are placed side by side on the bearing, a form of construction used in several V motors. The crankshaft has three main bearings, and the single camshaft in the center has a separate cam for each valve, making twenty-four in all. The camshaft is driven by silent chain from the crankshaft. Pistons are very light and made of a special aluminum alloy.

In the lubrication system the oil is forced through the drilled crankshaft and is delivered to the bearings in proportion to the power developed.

Setting the cylinder blocks at 60 degrees leaves room on the sides for the location of the starting and lighting units. A satisfactory turning radius is therefore made possible. The position of the exhaust manifolds on the outer side of the cylinder blocks does not interfere with the accessibility of the electric units.

Details of the chassis are meager at this time, although it is definitely stated that a dry-disk clutch is used, and that the wheelbase is 130 in. Left drive with a hard rubber, corrugated steering wheel; center control of a three-speed gearset; and the use of 34 by 4 tires are features that are also known. In the spring suspension, the cantilever construction is employed at the rear, with the front springs of usual half-elliptic type. The gasoline tank is hung at the rear.

In the general outward make-up of the car, the services of a well-known eastern body maker have been had, and the body design is what might be termed a semi-torpedo, with hood and cowl following the same nearly flat slope. The seats are low, with body sides comparatively high. Upholstery does not come over the sides, which are rounded in latest fashion. The new curve that is much in vogue at the back of the front seat is well worked out.

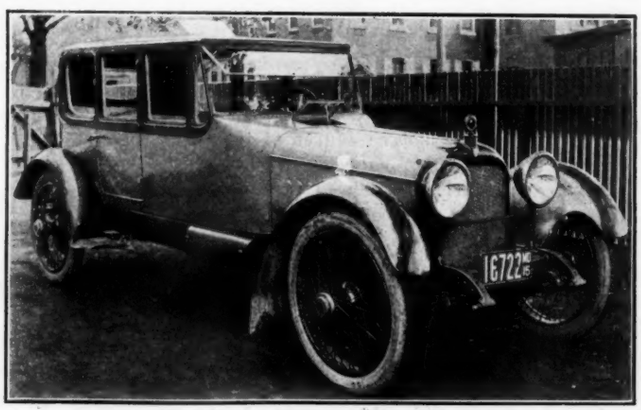
Unique Body on Mercer Chassis

BALTIMORE, MD., June 28.—R. W. Gill of Baltimore is the owner of what is perhaps the most unique closed car ever seen in the Maryland metropolis. It is a specially built Sedan on a 22-70 Mercer Sporting chassis, and embodies many ideas which are decidedly original.

A fair idea of the height of the car can be obtained when it is realized that a man of average height can stand on the ground and look over the top of the car. The seats are exceptionally low, the six-inch cushions resting directly on the floorboards. The front seats are of the individual type, one of them folding up to allow the driver easy access to the front compartment. The interior is decorated in gray whipcord.

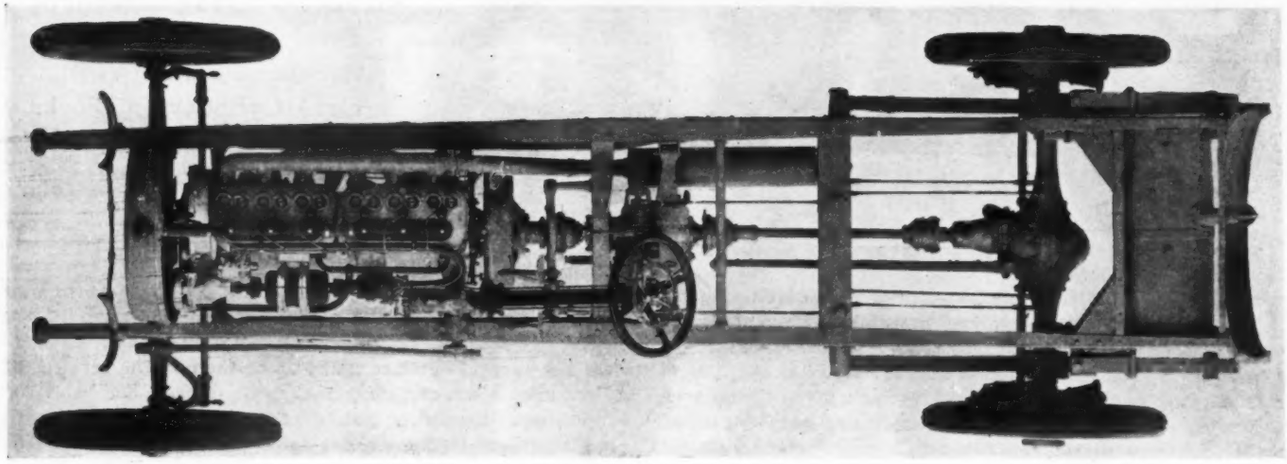
The cowl and roof are fitted with ventilators in the form of small skylight windows. They can be raised or lowered conveniently. On the forward part of the hood Mr. Gill has fitted a small opera light.

The running boards have been omitted, a wide step, suspended from the frame, being used instead. The absence of running boards gives the car a very foreign air, and the various points of individuality, particularly the lowness of the body, are worked out in a way to be especially pleasing.



Unique low sedan body mounted on Mercer chassis

Marmon Features Continued for 1916



Marmon chassis with independent gearset showing method of supporting both motor and gearbox on three points

A Study of the Engineering Principles in the Big Six

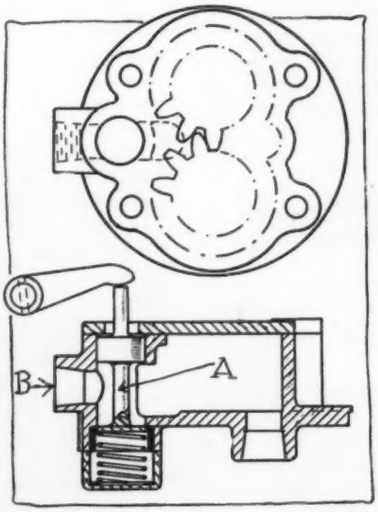
AS already announced in our news columns, the 1916 Marmon six differs but little from the 1915 model, but an examination of the design of the chassis is instructive because there are several Marmon features which have proved good and yet are highly unusual. The chassis as a whole is one of the most original in thought that America is producing to-day.

It is accepted that the running of a six depends upon the rigidity of the crankshaft support to a very great extent and the fact that the Marmon is noticeably free from vibration is traceable to the form of crankcase employed. First, there are seven main bearings on the crankshaft so that each throw has individual support, but this is hardly so important a feature as the way in which these bearings are fitted to the crankcase. In order to provide the maximum of rigidity to the aluminum casting it is made in barrel form. Thus the crankcase is almost the equivalent of a tube, in itself a very strong form to resist bending or distortion. Each of the seven crankshaft bearings is contained in the center of a circular, split-aluminum casting of diameter slightly in excess of that of the crank circle and these seven castings are first fitted to the crankshaft. This makes for a most excellent bearing finish, for the crankshaft can be held in any convenient manner while each bearing in its aluminum carrier is scraped and tested for proper contact. Also the degree of tightness of adjustment of each bearing separately can be tried, which is practically impossible with any other method of crankshaft mounting.

Tubular Crankcase

When all the bearings are in place and fitted properly the whole shaft as a complete unit is put into the crankcase, whereupon the aluminum bearing carriers are bolted in place and add enormously to the stiffness of the whole motor. The crankcase has then become a tube with a series of stiff partitions, a tube reinforced at seven places. It is claimed that the construction is lighter than any other which gives equal rigidity and this is easy to believe since the metal is so well disposed that very little of it can be dead weight; almost every particle of aluminum is doing its share of the work.

In the oiling system there is a novelty which has long been considered by many engineers as being a feature which will ultimately find a place on every chassis. This is an oil throttle which is opened or closed in conjunction with the carbureter throttle so that the pressure of the lubricant varies with the internal pressures in the motor which means that the more heavily a bearing is loaded the more oil is fed to it. Actually the pressure ranges from 12 to 60 pounds per square inch and the way in which this is accomplished is extremely simple. In the drawing on this page is shown the oil pump in section and plan. The little plunger *A* can be depressed by the small lever, and the latter is joined to the carbureter throttle by a straight link rod. As the plunger is depressed the upper piston portion closes the orifice *B* so restricting the oil supply. The spring under the lower part of the plunger is used to return it to the open position and the dumbell shape of piston, of course, equalizes the pressure so that the oil neither tends to open the throttle nor to close it.

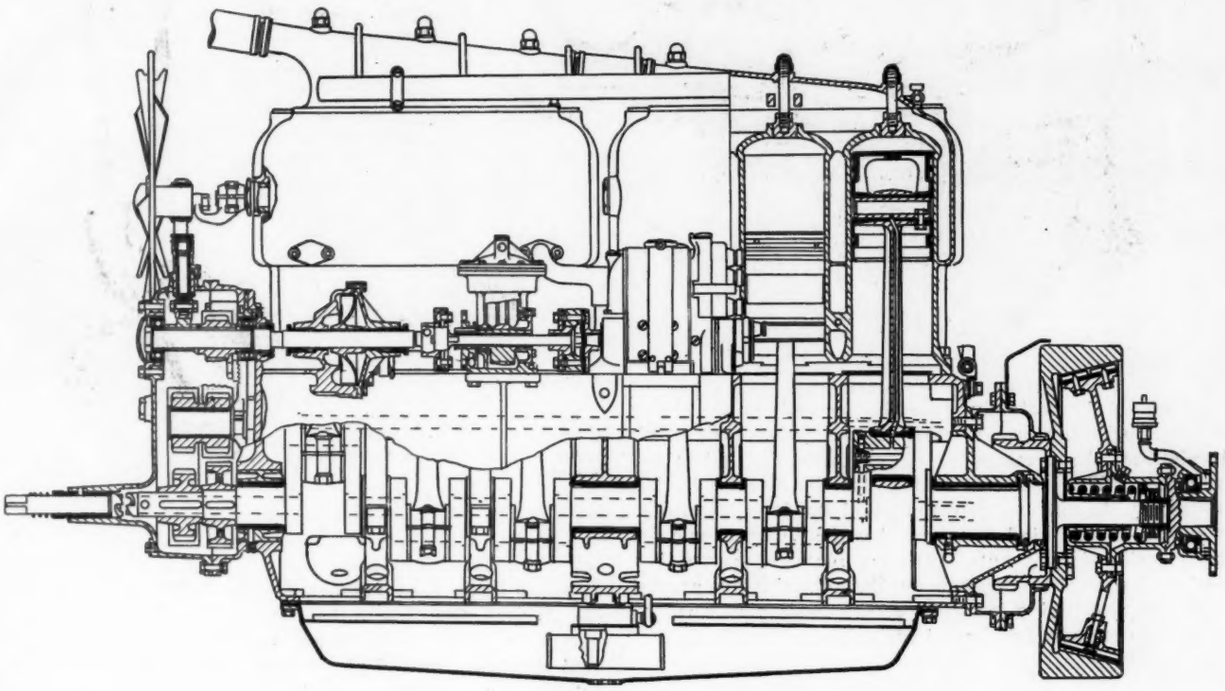


Marmon oil pump with throttle which adjusts pressure of oil in accordance with carbureter opening

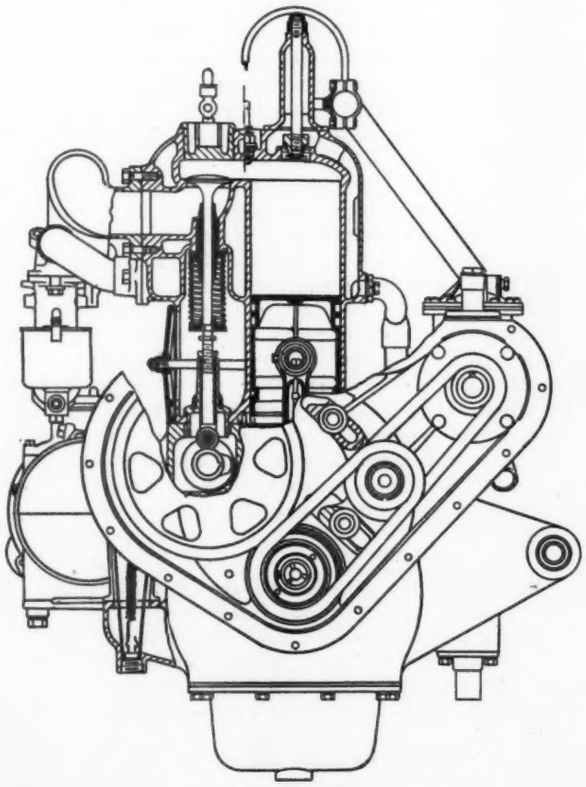
Oil to Main Bearings

The oil is forced to each main bearing and so gains entry to the hollow crankshaft whence it is conducted to the connecting rod bearings, the piston pins and the cylinders. In addition the camshaft, with its eight bearings, is separately inclosed in an aluminum tunnel which is kept filled with oil under pump pressure, and a tiny hole is drilled through each

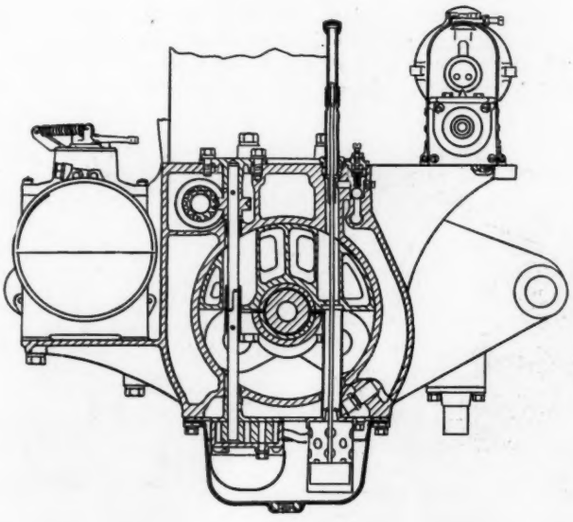
Sections Through Units of the Marmon 1916 Product

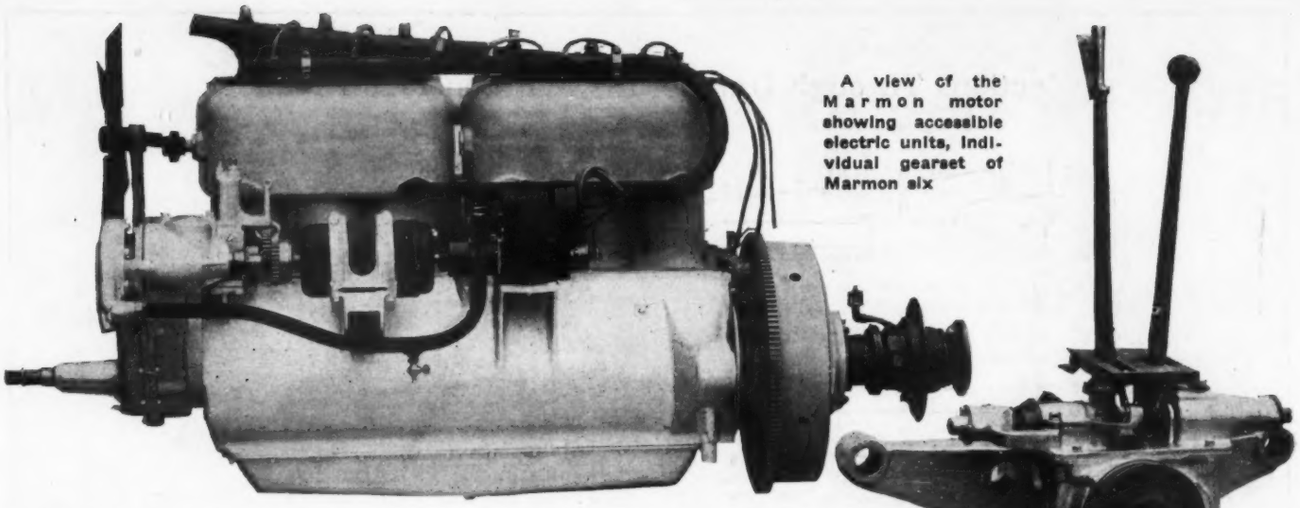


Longitudinal part section through the Marmon six motor showing crankshaft suspension and clutch detail, etc.



Transverse section through motor and section through crankcase showing oil level gauge and pump with auxiliary mountings





A view of the Marmon motor showing accessible electric units, individual gearset of Marmon six

Gearset and housing with control members used on the Marmon Six for 1916

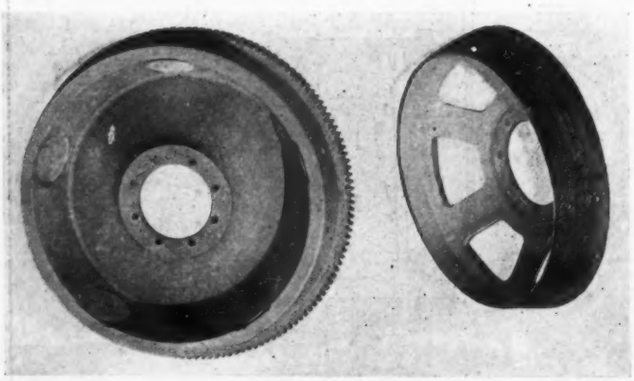
tappet rod. This allows the oil to escape over the head of the tappet immediately beneath the end of the valve stem so lubricating every part of the valve gear, and, it is claimed, the presence of oil at this point quiets the valve action. This is no new feature for the Marmon having been used by the makers for many years, but it is not always that things of this kind are remembered as they should be. It necessitates a tight valve inclosing plate, of course, but there is a large return passage for the oil which lies around the tappets after doing its work, so the cover plates can be removed without any lubricant loss.

Gear-and-Chain Drives

Another somewhat unusual feature is the use of both gear and chain front end drives, the camshaft being driven by a spur gear and the pump or magneto shaft by means of a pair of short chains which run over an intermediate idler for adjusting purposes. This layout is shown in the end view drawing of the motor and it should be observed that it calls for only a small inclosure. Everything is very compact and there is no waste space.

Independent Gearbox

Last year the Marmon company introduced a new clutch with the peculiarity that the cushion springs were located in the flywheel instead of beneath the asbestos cone facing. This feature is continued but it might be well to point out the fundamental advantage. Woven asbestos and wire fabric is heavier than leather and also stiffer, so, to prevent centrifugal force causing it to lift from the cone it is well to secure it as tightly as may be with many rivets. If the clutch cone and facing are thus made as much like one piece as they can be the facing cannot fly out and drag on the flywheel when the clutch is withdrawn. Again, it is easy to fit to the flywheel large area contact springs which give an easier engagement that might be obtained readily from smaller ones beneath the facing material. Of course, the drawback is that it costs a good deal more to machine the flywheel with the necessary recesses for the springs than it would to fit them to the cone.



Marmon clutch with cushion springs set in flywheel instead of beneath fabric facing of cone

Apart from manufacturing considerations there is much to be said for the use of an independent gearbox and there are many who adhere to the belief that it is quieter than any gearset that is in unit with the motor. In the Marmon instance the use of a unit powerplant would be rendered a little difficult on account of the crankcase design so the manufacturers have no regrets in choosing what they consider the better practice of separate parts.

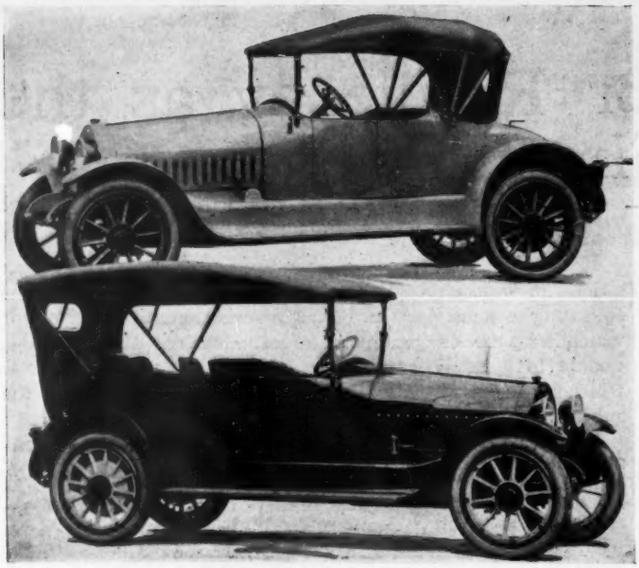
Like the motor the gearbox is attached at three points, two at the rear and one in front. Between gearbox and motor is a universal coupling that allows for any small disalignment that may arise through frame weave, and the splined shaft that carries the sliding gears is very large and stiff.

As can be seen in the chassis view the clutch and brake pedals are carried on a shaft secured to the same cross frame member that supports the front end of the gearbox, while the gear shift and emergency brake levers are mounted centrally upon the gearset. Very particular care is taken in supporting the gear lever as can be seen, the long bearing on either end of the cross shaft insuring that the lever shall always move across the strikers without the least hint of sticking. In practice it is to be doubted whether there are any cars which have an easier handling gearshift and certainly very few indeed have one that is even nearly as good.

Drives Through Springs

Drive from the spiral bevel rear axle is taken through the springs, but the torque is supported by a substantial pressed steel member. It should be noticed that the intermediate brake gear is carried on a cross rail of the frame located at the place where the front end rear spring hangers are attached, this serving greatly to strengthen the rigidity of the drive.

As said before the above dissertation on points of design only touches upon a few new things. The dimensions of the motor remain 4.25 by 5.5 in. bore and stroke, 468 cubic in.,



Above—Marmon 41—Three passenger club roadster. Below—Marmon 41—Seven passenger touring model

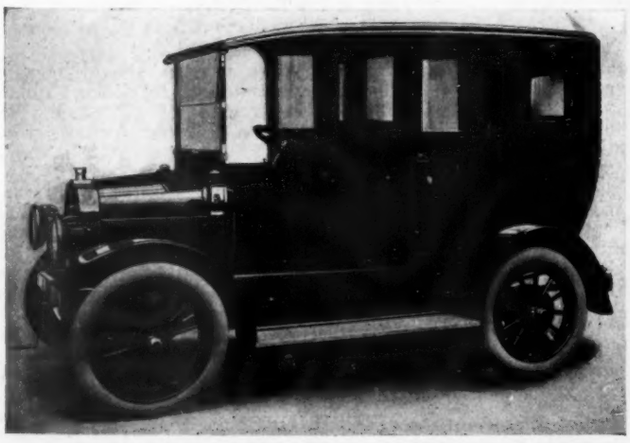
the wheelbase is still 132.5 in. As last year the starting and lighting system is all Bosch with a Willard storage battery and a Bosch magneto is used for ignition. Tires are Goodrich Silvertown 36 by 4.5 all round with one spare rim in the equipment and the price is $3250 for all models except the seven passenger touring car, which costs $3350. There are five models in all, speedster, roadster, four, five and seven-passenger touring cars.

Gear ratios are proportioned to the work the car is expected to do being 3.06 to 1 for the speedster, 3.5 to 1 for the roadster and four-passenger and 3.77 to 1 for the two larger touring cars.

Body Styles

This year a few special three-seated bodies will be made of the clover-leaf pattern where the middle passenger sits between and slightly behind the driver and his companion; one of these was nearing completion on the occasion of a recent visit to the plant and is a smart looking and most comfortable type.

As to the touring bodies these are now aluminum instead of steel so being a little less in weight, and much care has been given to their detail finish. The upholstery ends flush with the body sides and are secured by an internal bead so that the leather is invisible externally, giving a sharp outline to the body. Really the easiest way to describe the body changes is to say that the upholstery and fittings have been gone over with a microscope and every little thing which marred appearance has been removed or altered. There is the same space, the same comfort, the same quality of material, but the new body looks pleasing from every aspect instead of better some ways than others.



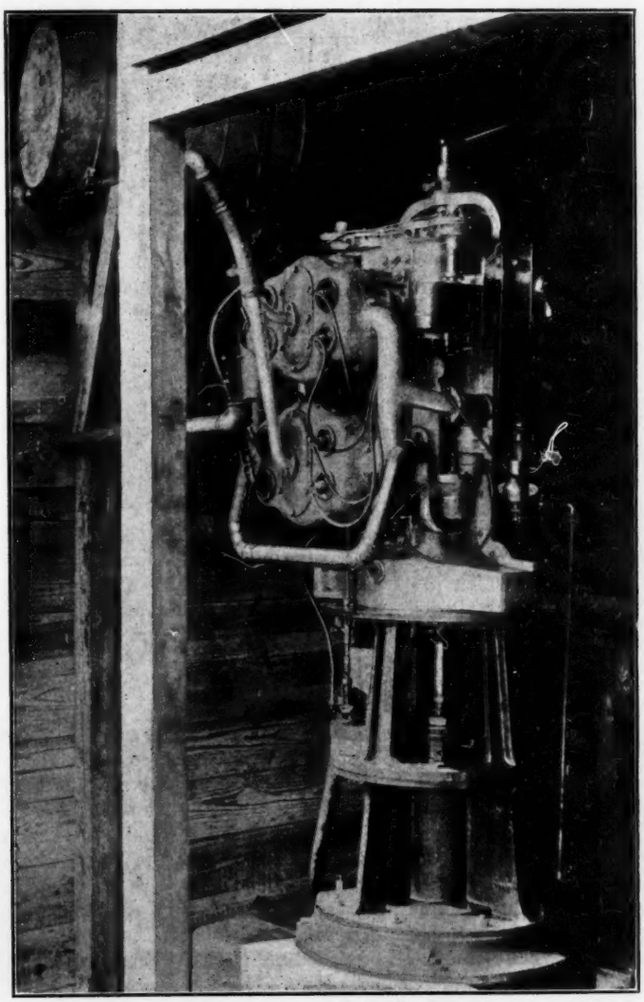
Taxicab recently brought out by Touraine Co., Philadelphia

Wisconsin Motor Operates on End

An interesting example of what can be done with an automobile engine is illustrated herewith. This is a stock model A 4.75 by 5.5 Wisconsin motor, model U, mounted so that the crankshaft is vertical instead of horizontal. The shaft is directly connected to a centrifugal pump and is delivering 750 gallons of water per minute for 10 hours a day.

The biggest difficulty, of course, to overcome in this installation was the proper oiling. In its natural position, the motor has its oil reservoir in the bottom of the crankcase, but in this instance a separate oil tank is placed under the engine and the oil pump connected to the bottom end of the reservoir. From here the oil is pumped directly to the main bearings and then forced through a hollow crankshaft to the connecting-rod bearings. The oil is forced out of the connecting-rod bearings and thrown to the cylinders and other motor parts, then draining back to the reservoir through a strainer.

A feature is the arrangement which has been made to crank the motor. It will be noted there is a platform erected behind it and a long cranking handle placed within reach. The cooling water is in the tank shown above the engine.



Vertical automobile motor made horizontal for stationary work

Bostonian Argues for Resiliency as the Measure of Tire Efficiency

Introduction and Commentary by M. C. K.

NOBODY doubts that resiliency has so far been found to be one of the properties in a tire which is intimately associated with the possibility for getting satisfactory work from the vehicle to which the tire is fitted, and this intimate association with desirable ends has tricked many persons into accepting the measure of resiliency in a tire as the measure of its efficiency, to the effect of encouraging the idea that increased efficiency can surely be obtained if tire makers succeed in increasing the resiliency. A premium is thereby offered for a stronger rebounding capacity in tires, and the search for improved tire materials is artificially limited to those in which resiliency and pliancy go together in the same close union as in rubber and air, the close union of the properties in these materials being in fact the main prop for the fallacious and restrictive axiom by which one of these properties is selected as a measure of tire virtue.

Theory's Practical Sting

Considerable trade importance is connected with the axiom when it is introduced in the specifications for tire supplies in the form of a demand that the tires shall measure as high as possible by a resilio-meter test, thereby placing those tires under a trade ban whose makers aim for improvement through efforts going in a different direction and offering perhaps better chances for ultimate perfection of tires and for a better adjustment of tires to the spring suspension and to loads and speeds. When it is said that resiliency is becoming accepted among electric truck builders as a measure of tire quality, it may be worth noting that a portion of the weight of electric motors is usually suspended upon the wheel axle and that therefore a spring action from the tires may be more needed for this class of vehicles than for trucks and omnibuses in which the unsprung weight is smaller or more robust, and also that the springs of electric trucks are usually made according to the formula which reduces the first cost of the springs to a minimum, namely short, stiff and of small range. While it is not certain that the most resilient tires must necessarily serve best to offset the shortcomings of such springing—for which a great deal can be said at the present stage of spring suspension practice—it is probably true that auxiliary spring qualities are at present most readily found in tires in which the resiliency is as pronounced as possible. It is when the alleged axiom is accepted as having a universal validity governing for all efforts for tire improvement that the need of a sharp distinction makes itself felt.

One Conclusive Exception

Railroads prove conclusively that tire improvement does not tend in the direction of increased resilience when roads are radically improved, and it is almost equally obvious that the shortest road to tire efficiency (in the case of solid tires which notoriously do not allow the road inequalities to sink into them in any degree at all comparable to the action of air tires in this respect) may not be found through an increase of either their pliancy or their resiliency, but very probably through increasing their durability while at the same time enlarging and improving the action of the spring suspension with which the tire co-operates. The universal validity of the alleged axiom is thus disproved in advance by a cursory and untechnical examination of the facts. The hold it has gained in wide circles is so much more remarkable, and the following communication offers an argument in its favor which may be of general interest, although the writer is unable to discover any points or chain of reasoning in it which have not already been met in previous articles on the subject.

Editor THE AUTOMOBILE:—After reading with considerable interest M. C. K.'s comments in the June 10 number of THE AUTOMOBILE on Mr. Duryea's letter of May 21, 1915, I am wondering if many other readers of your popular magazine are not asking, like myself, "Which man is right?"

I would, therefore, like to present a somewhat different analysis of the factors affecting the power efficiency of tires, hoping that it may serve to "clear the air," so to speak, and perhaps bring about a solution of the problem which will be satisfactory to both parties.

In the first place, it may be taken for granted that the maximum power efficiency will be obtained when the sum total of the losses, of whatever nature, are a minimum; and it only remains for us to determine what combination of qualities tend to produce this result without sacrificing any of the the necessary functions which it is intended that good tires should possess.

I agree with M. C. K., when it comes to formulating these rules from the results of certain road tests, that it is not sufficient to take one set of conditions and assume that your conclusions will apply equally well to all other conditions. Nevertheless, I maintain that there are certain underlying principles which will always govern the results and cannot be disregarded by those who seek to explain through "logic" such every-day phenomena as riding qualities, efficiency, etc.

It seems advisable at this point to define the terms commonly used to describe the properties of elastic bodies,—namely, flexibility and resiliency—so as to avoid any possible confusion in the reader's mind, due to his having a different conception of these terms from that of the writer's.

FLEXIBILITY

Briefly stated, flexibility signifies the degree of pliancy, and should only be used to denote the ratio between the amount of deflection or compression and the force producing it, subject to the following conditions: That the elastic limit is not exceeded. That the forces acting are at rest. That the spring-action of the body is undamped either by external or internal friction.

We may represent this property by the following equation:

$$f = \frac{D}{L};$$

where f = the flexibility,
D = the deflection,
and L = the load applied.

In measuring the flexibility of a tire we should be very careful to eliminate the effect of molecular friction; otherwise the results of different observations will not check. We should also specify the load applied, because f varies with the load and is not constant as in the case of a metallic spring.

To get a true idea of the comparative flexibility of different tires we should plot a curve, using for abscissae the load applied, and for ordinates the deflection. In the pneumatic tire we should remember that there is a marked distinction between the flexibility of the tire wall and the flexibility of the tire as a whole when inflated; and we should always make clear which is meant.

We should also distinguish the difference between "flexibility," and "resistance to flexion," because friction affects the latter but not the former, and consequently may produce a marked difference in the behavior of the tire.

RESILIENCY

Resiliency expresses ordinarily the "liveliness" of an elastic body, and is represented by the ratio of the *energy* recovered

in the rebound to the *energy* in the blow. It depends entirely upon the extent to which the action of compression and the subsequent expansion is damped by friction. It is in itself an expression of efficiency, or "output-over-input"; and should not be confused with "flexibility" which is based on the action of a *frictionless* spring or other elastic body.

If one tire is more resilient than another it does not mean necessarily that it is less flexible as a whole, but it may be due to superior construction which reduces the internal molecular friction, notwithstanding the fact that the same tire may be made more resilient as a whole by using a higher degree of inflation, which at the same time, of course, reduces its flexibility.

EFFECT OF RESILIENCY ON EFFICIENCY

In determining the effect which resiliency has upon efficiency it is quite possible to answer the question without going into a lengthy explanation of the reaction of the tire upon the road surface, which is more or less involved and seems to have led some thinkers away from the solution of the problem rather than toward it.

In view of the fact that the tire is an elastic body it must be flexed to a certain degree by the load which it is obliged to carry. Furthermore, since it *is* elastic, it must recover its original shape when the load is removed, otherwise the tire would grow thinner and thinner with each revolution of the wheel like a batch of dough under the action of the much abused rolling-pin. During each cycle of compression and expansion a certain amount of energy is consumed in overcoming the molecular friction in the wall or other solid elastic parts of the tire. This energy is entirely wasted and appears only in the form of heat, which under certain conditions may become very intense. Obviously the energy so consumed detracts just that much from the propulsion of the vehicle; and, in the proportion this loss is reduced, the efficiency will be increased. There can be no other result.

As far as the bouncing of the wheels on the road is concerned, we have to consider other factors besides the resiliency of the tires, because that is only one among the many involved, and I doubt if it can be proved that bouncing in itself retards the vehicle excepting as it allows the driving wheels to slip on the road if they are thrown upward with sufficient force.

Fortunately there are other ways of preventing the wheels from bouncing than by reducing the resiliency of the tires, which it has been demonstrated greatly reduces their efficiency. Increasing their flexibility as a whole is one way, and for the others we may turn to the designers of the springs, running-gear, and shock-absorbers to provide.

CONCLUSION

The task of the tire builder, as I see it, is to build a tire which will properly relieve the unsprung portions of the car from the shocks due to small irregularities in the road surface; and at the same time, if the tire is to have the maximum efficiency, which means that the internal losses shall be a minimum, it must be resilient whatever its flexibility.

Boston, June 21, 1915. RUSSELL HASTINGS.

P. S.—If I have not made myself quite clear on any points, I should appreciate having the privilege of explaining them before you publish the letter (if you see fit to do so) rather than afterwards.—R. H.

Single Criterion Usually False

In view of the postscript the writer refrains from all detailed comment upon Mr. Hastings' presentation of the subject, so much more willingly as he knows of no single property which can be accepted as a criterion of tire efficiency in the place of resiliency but inclines to the belief that tire improvement must go hand in hand with the improvement of springs, wheels and roads, must vary in its means with the vehicle speed and maximum load and, on the whole, is as closely interwoven and organically connected with other motor vehicle improvements as, for example, the type of the motor. The greatest fuel efficiency is no doubt obtained from a motor of very high piston speed, yet no one could contemplate establishing motor speed as a measure of motor merit. It would be an industrial calamity if anybody succeeded in doing so.

When the subject in hand is narrowed down to a question of the desirable properties in solid tires, the writer would formulate the task of the tire maker along lines somewhat different from those followed by Mr. Hastings. With no restricting theories to work for, traction qualities, noiselessness and durability become the leading requisites, with economy in cost of production closely following and with reform efforts directed mostly toward inducing vehicle manufacturers to adopt such wheel and tire dimensions and such spring systems that the effect of tire material upon power efficiency of the vehicle will be reduced to a minimum.

By working for large dimensions, the demand for power efficiency can be met in a rational manner to a considerable degree and whatever may be further done for the same purpose through improvement of the tire material may then be undertaken under small stress. The most prominent considerations which arise in this connection seem to the writer to be the following.

Requisites for Power Efficiency

Power efficiency is determined mainly on smooth roads, in so far as a tire which is not efficient on smooth roads will have a low total efficiency—the smooth-road action of a tire being the fundamental one to which all other action is only spasmodically added—and it is known that the smoother the road the more rigid the tire should be to have power efficiency. Neither pliancy nor resilience is here wanted. Pliancy is wanted however for absorbing shocks and giving vehicle springs time to start their action, as well as for noiselessness. Resilience, though a prime requisite in stationary (not rotating) vehicle springs, is wanted in tires only to restore the deformed tire to its round shape and only in the degree required for that purpose. All other usefulness of resilience in tires, to increase power efficiency, is fictitious. The power wasted in flexions is not restored for use in propulsion by a resiliency which restores a tire to its shape with such promptness as to cause a rebounding of the vehicle. Resilience in tires only keeps the pliancy of the tires operative.

In accordance herewith, the requisites for producing power efficiency are rigidity on smooth roads and pliancy for shocks plus a modicum of resilience to maintain the shape of the tire. These requisites are plainly contradictory and have to be reconciled by compromise, but resilience plays a subordinate part among them and cannot be the leading aim.

A Question of Materials

Necessity is something else. It may be a necessity to use highly resilient materials in order to obtain the pliancy and flexibility that are wanted. The use of compressed air in air tires is an important example. It is wonderfully pliant but also so resilient that it reacts at once with full force against any deformation. For its use in tires its resilience in this degree is unfortunate, as it takes effect in bouncing the wheel back from the very same obstacle which causes a deformation, unless the vehicle speed is high. Now, the question for the maker of solid tires may be said to be just this—where power efficiency to be obtained through the choice of materials is concerned—of finding a material which will act at all speeds as an air tire acts at vehicle speeds so high that the excessive resiliency of air does no harm, getting no chance for rebound against the ground.

It is certain that a highly resilient material is not what is intrinsically wanted, as it has the drawback of causing immediate rebound. But whether the high resilience can be sidetracked in practice is another question. To solve it by assuming that maximum resilience is a virtue is to make a virtue out of something which has not even been proved to be a necessity.

Dimensions Reconcile Conflict

On the other hand it is easily demonstrated that large dimensions offer one safe method for reconciling the conflicting demands in some degree, giving comparative rigidity for smooth roads in conjunction with an acceptable degree

of flexibility for absorbing shocks resulting from impacts with relatively small objects.

Specific Pressures Most Important

The larger the wheel and tire, the smaller the flexion which will produce a considerable contact area for the support of the load and therefore the greater the flexibility which can be allowed in the material to help in absorbing the road obstacle and in tempering the shock.

It may perhaps be objected that the work involved in the flexion is always determined by the load and should be the same whether the flexion is large or small, but, as the work done also depends on the distance through which the load must act in accomplishing the flexion, it is susceptible of proof that a flexion which may be considered as dropping the load level one-quarter inch (in the case of the large wheel and tire) consumes less power than a flexion caused by the same load but involving a drop of the load level amounting to one full inch. This is perhaps generally admitted and the demonstration need therefore not be made explicit.

Road Dust in Cylinders and Bearings—Effects and Remedy

CARBON deposits, it is widely admitted, are more troublesome the higher the piston speed of the motor. Clogging of carbureter nozzles, it has been whispered from abroad, occurs with some frequency in those excellent carbureters in which a little air is admitted to the interior of the jet. Chemical analysis of the carbon deposit in any motor, it has been established in Germany, reveals a proportion of silica varying from 2 to 8 per cent, besides some other impurities which can scarcely be traced to any other origin than road dust. These observations singly and jointly call attention to a feature in construction and operation which seems to have been neglected and which may yet have a considerable influence on the adjustment and durability of motor bearings, on compression, on knocking, on premature ignition and on backfiring. The feature referred to relates to the lack of provisions for keeping road dust out of the fuel charge and thereby out of the cylinders.

Assuming that a certain amount of dust is in suspension in the air under the motor hood but is in the act of settling by gravitation owing to the slowing up of the air current which takes place after it has passed through the fan, it stands to reason that more of this dust will be drawn through the carbureter if the suction is strong than if it is mild, and that the motor with high piston speed therefore will inhale more dust per cubic inch of air than the slower motor. As its combustion chamber is also smaller and more compact, having a relatively smaller wall area, and as flame propagation is more rapid in this type of motor, it is not difficult to believe that the necessity for frequent removal of the carbon deposit from such motors has something to do with the amount of dust inhaled and is not merely an expression for the related fact that any coating interferes more with operation in a high-speed motor than in a slower one on account of the greater need of good cooling and of keeping the volume of the combustion chamber from being reduced. In the majority of informal statements on the subject it is claimed that the carbon deposit is thicker as well as more troublesome in the high-speed motor, and this would be almost conclusive with regard to the source of the deposits if the obtainable data were explicit in giving dates and mileage. If everybody who has kept records bearing on the subject, including records of his motor repairs, would contribute a copy of them to the fund of public information, the question could probably be decisively answered even if each contribution were not very complete.

Why Air Is Not Filtered

The principal objection to filtering the air which enters the carbureter is perhaps the same which militates against the use of backfiring screens, namely that any arrangement of this nature tends to obstruct the flow of air and thereby reduces the volumetric efficiency, counteracting the good effects of large channels and valves, unless the whole air conduit is considerably increased in area—and this would mean an increase of some of the carbureter dimensions. While the points in carbureter design which are involved are not the same for filters as for backfiring screens, which are above the jet, they are practically the same as for the use of screens in aviation motors to prevent a carbureter fire from spreading to other parts. It is perhaps worth while inquiring if something may not be done to reduce the dust intake without interference with carbureter design and dimensions.

Strong Hint from Radiator Practice

A discussion at one of the S. A. E. meetings throws some light on this possibility, which consists in filtering the air before it enters the hood. A paper on radiators by Howard Greer, Jr., of the McCord company, gave occasion for the remarks which bear on the subject, and while these did not refer to the dust question at all but solely to cooling, especially fan and radiator efficiency, they seemed to establish the desirability of diffusing the air current passing through the radiator as much as possible—by whatever suitable means this may be accomplished—and thereby suggested that some kind of an air filter might be used for this purpose, not only serving to exclude the dust but also regulating the cooling effects of fan, radiator and vehicle speed.

Some of these remarks are herewith quoted. "After you drive the air fan beyond a certain speed you get air at anywhere from 950 to 1150 ft. per min.; if you get it at a higher rate than that you shoot a core of cold air right through the center of the air passage [meaning each of the many air passages in a radiator]; the skin air is not disturbed and you do not take the heat out [of the adjacent water tube] in proportion to the speed at which you are driving air through."

With regard to the factors which make dust tend to settle, like the impurities of river water in a settling basin, the following is of interest: "Air is pulled through the radiator and jammed against the motor, starter, water manifold, exhaust manifold, wires and all kinds of things." And, speaking about blowing some sparks—which may be considered incandescent specks of dust—and seeing what happens to them: "I have seen a spark put in from the front of the car go over and actually circle around the manifold and then dive down to the bottom and then come out. . . . The space is not only restricted but baffled; these restricted corners cause all kinds of swirls, and the velocity of the air going out is much less than of that coming in, because it creeps out the sides and front and all kinds of places instead of going out some definite passage." Also: "In the conventional construction you take a highly refined piece of mech-

(*Continued on page* 29)

Splitdorf Announces Twelve-Cylinder Magneto

Dixie Models Now Include Eights and Twelves—Eight Operates at Engine Speed

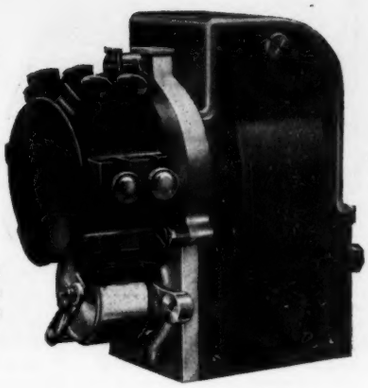


Fig. 1—The latest Dixie magneto has its twelve terminals arranged on a compound distributer

BY adding a 12-cylinder model to its line of Dixie magnetos the Splitdorf Co. is able to furnish ignition for any automobile engine on the market. This new magneto operates on the same principle as the other Dixie models, having stationary windings and no armature in the ordinary sense.

The Mason principle on which the Dixie magnetos operate is a radical departure from ordinary magneto practice, and possesses many features of great interest. In the first place the rotating shaft passes through the magnet poles instead of between them and instead of carrying an armature on which the windings are placed this shaft carries two solid polar extensions separated by a non-magnetic distance piece. Surrounding these revolving pole pieces is a light laminated field structure consisting of two pole pieces *F* and *G*, Fig. 2, and a straight core on top. This core carries both primary and secondary windings. The principle of operation is that

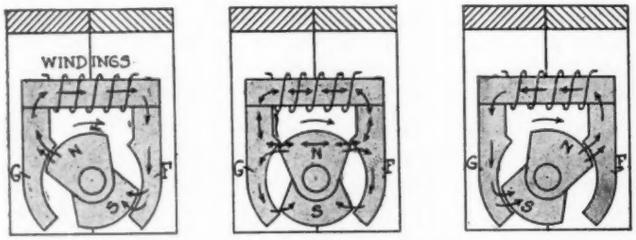


Fig. 2—Principle of operation of the Dixie magneto showing the stationary windings and magnetic field

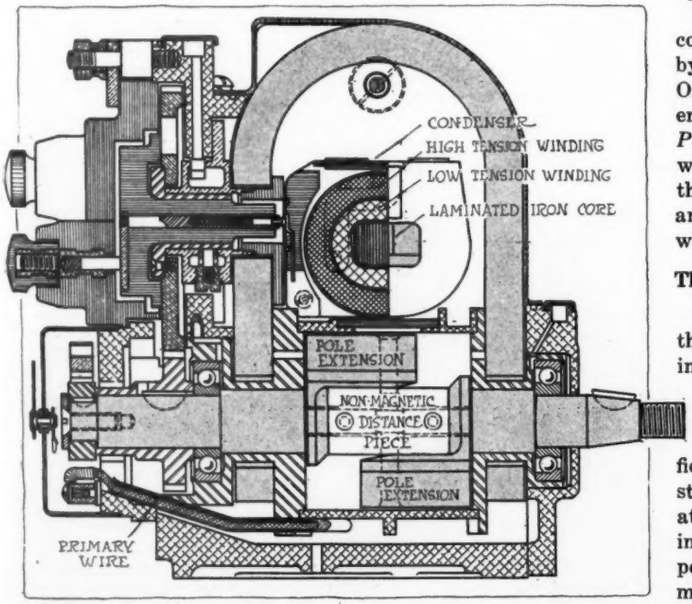


Fig. 3—Half-size section to scale of the 4-cylinder Dixie showing location of stationary windings and rotating pole extensions

of sending magnetic lines alternately in opposite directions through the field structure. It will be seen that the pole extensions *S* and *N* are simply a means of carrying the magnetic lines from the main magnet to the laminated field structure and that they do not change their polarity. In the four- and six-cylinder models each polar extension embraces about 90 degrees of the tunnel.

Path of the Flux

When the pole *N* is adjacent to *G*, Fig. 2, left, the magnetic flux flows in the direction of the arrows through the core of the windings from left to right. Continuing the rotation of the poles until they occupy a vertical position it will be seen that the field of the magnet is shorted through the pole pieces, cutting out the magnetic flux entirely from the core. Passing this point in rotation the pole extension *N* then comes into a position adjacent to *F*, causing the magnetic lines to flow once more through the core, but this time in the opposite direction, that is, from right to left. This reversal of direction of the magnetic flux is of course a necessary feature in any magneto and is the means of inducing the current in the windings.

In order to render this reversal easy and complete the path for the magnetic lines is made up of thin iron laminations such as are used also in the construction of the armature in the ordinary magneto. The Splitdorf Co., however, make the claim for the Dixie construction that a point of great efficiency is obtained since the bulk of iron in the stationary field structure is so small, its size being governed entirely by magnetic requirements.

The windings are remarkably small, being wound on a core of only 0.75 by 0.5 in., Fig. 3. The core is held in place by two screws passing through slots in the projecting ends. One end of each of the two windings is earthed. The open end of the high tension winding terminates in a contact plate *P*, Fig. 6, embedded in a rubber block at the side of the windings. The open end of the primary winding passes through a brass tube which leads to the base of the magneto and so to the contact breaker, Fig. 3. In dismantling, this wire is the only electrical connection to be loosened.

The Rocking Field

One of the most important features of the magneto is that the whole of the laminated pole structure including the windings can be rocked through several degrees. This rocking is accomplished by turning the timer arm of the circuit breaker in the ordinary way to advance or retard the spark. By means of this positive connection between the field and the circuit breaker it is possible to arrange the instrument to produce the sparks either advanced or retarded at the critical moment when the most magnetic lines are being cut. Hence the magneto has no one point in its spark position when the intensity of the spark is maximum or minimum; it is uniform all the time.

The distributer on the four- and six-cylinder models, Fig. 6, consists of an insulating block with a short spindle at one

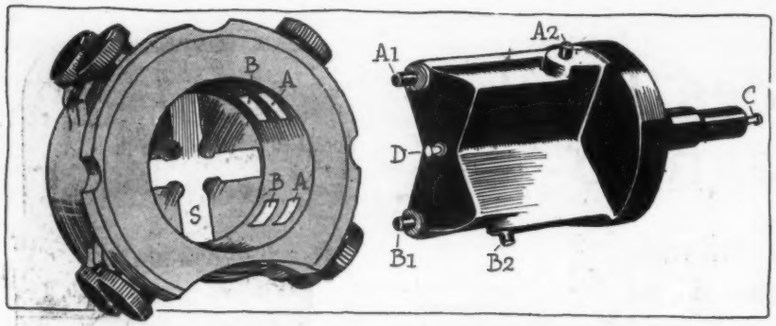


Fig. 4—Compound distributer box and block on the eight-cylinder Dixie magneto. The distributer on the twelve is the same except that the contact piece S which transfers the high tension current to the terminal plates through the brushes in the block is six-pointed to supply the twelve terminals

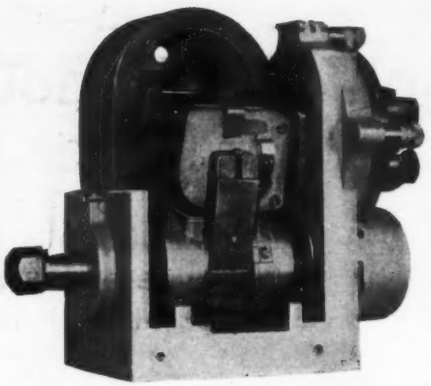


Fig. 5—Interior view of four-cylinder Dixie with cover and one of the magnets removed to show the windings and rocking field

end of which is a spring brush bearing on the contact quadrant *P* on the windings. The high-tension current passes from this point to a radial arm on the distributer face and so to the outer terminals of the instrument. A good feature is the shortness of the path for the current from the windings to the terminals. A safety spark gap is included in the high-tension circuit at the base of the windings, and the condenser is located on top.

In the circuit breaker, Fig. 6, it will be seen that nothing revolves except the cam attached to the shaft. By this construction it is possible to adjust the contact points while running as the contact bases are stationary. The grounding terminal is insulated on the end of the spring clip which holds the breaker cover in position and as it bears on the center of the cover the ground wire is also stationary while moving the timer arm.

The four- and six-cylinder instruments are identical in every respect except the distributer and timing gears. In the eight- and twelve-cylinder models the shape of the rocking field and also the polar extensions are changed so that four sparks can be produced in each revolution. Fig. 6, right, shows the shape of the laminated pole pieces which embrace only 50 deg. each of the upper half of the tunnel, instead of 90 deg. In order to obtain the requisite number of magnetic reversals with these pole faces the main polar extensions are in the form of a cross, two ends being of *N* polarity and two of *S*.

The New Compound Distributer

As it is practically impossible to obtain more than six contacts in a flat distributer disk of ordinary construction without a great risk of short-circuits caused by dangerously small electrical hazard distances a particularly ingenious compound distributer, Fig. 4, has been designed for the eights and twelves in which the terminals are not arranged in one plane as in the four- and six-cylinder models but in two parallel planes. In the compound distributer block on the eight-cylinder instrument the high-tension current is led through the center of the block from the brush *C* in contact with the windings to the brush *D* which bears on the center of the cruciform contact plate *S* embedded in the distributer box. This plate has no connections with any terminals but is a means of conducting the current in turn to the eight terminals as follows: In operation the plate *S* becomes "live" by contact with the brush *D* as before explained. Rotating over the ends of *S* are the two brushes *A1* and *B1* connected respectively to two similar brushes *A2* and *B2* in the side of the block. The path of the latter brush *B2* includes the four contact pieces *B* connected to the four of the terminals while the other brush *A2* rotates in the path of the terminal plates *A* connected to the remaining four terminals. Now, since the two brushes *A1* and *B1* are arranged 135 deg. apart it follows that eight sparks will be distributed to their respective terminals in one revolution of the distributer block in equal divisions of time. The timer gear is in the ratio of 2 to 1 so that this magneto runs at engine speed, an unusual feature of an eight-cylinder magneto. On the twelve the distributer gear ratio is 3 to 1 requiring a speed one-and-one-half times the engine speed.

12 Distributer Similar to 8

The distributer for the twelves is identical in every respect except that the contact star at the base of the box is six-pointed instead of four to supply the twelve terminals which are arranged in two layers as shown in the external view, Fig. 1. By the use of the compound distributer block on the eights and twelves as many as 285 sparks of high intensity can be obtained per second. Owing to this high speed of spark production a double contact breaker having two breaker arms and contact points is used on the twelves.

Constructionally the Dixie magnetos are up to the present high standard of practice. The shaft runs on ball bearings, tightly fitting brass side covers inclose the magnets and the

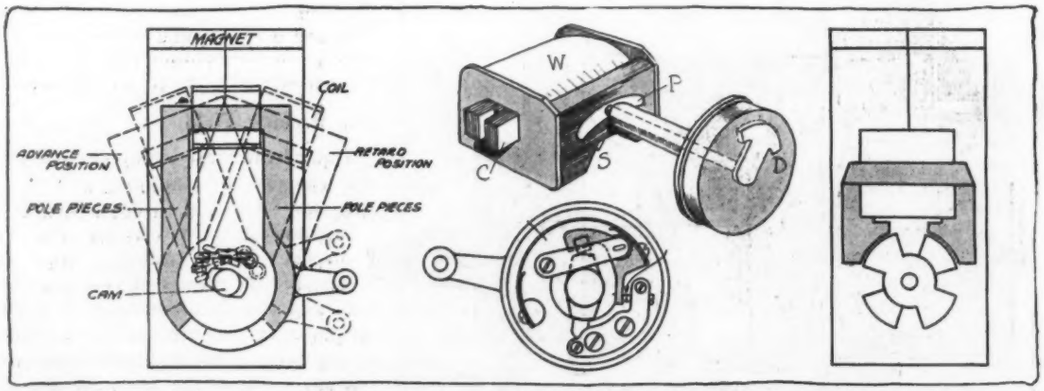


Fig. 6—Left, showing how the laminated field with its windings rocks inside the magnets simultaneously with the circuit breaker. Center, the windings and distributer block of the four-cylinder model, and below, the distributer with stationary contact points. Right, the laminated field on the eight and twelve-cylinder magnetos in relation to the rotating pole extensions

whole instrument can be dismantled with no other tool than a screwdriver. The magnet itself is in two parts and fits into place without bolting, having semi-circular notches which embrace the shaft bearing. Great accuracy has been used in the manufacture of the rotating pole extensions, the clearance between the ends and the stationary poles being brought down to the workable minimum. An interesting point in connection with the operation of these pole extensions is that end thrust is neutralized by the equal magnetic pull on both ends of the rotor. The compactness of the magnets can be realized from the dimensions which except in the height are practically identical in all models. The common width is 4.125 inches and the total length 8.375 inches. On the twelve the height of the magnet is 7.5 inches being one inch more than the others so as to provide a stronger magnetic field.

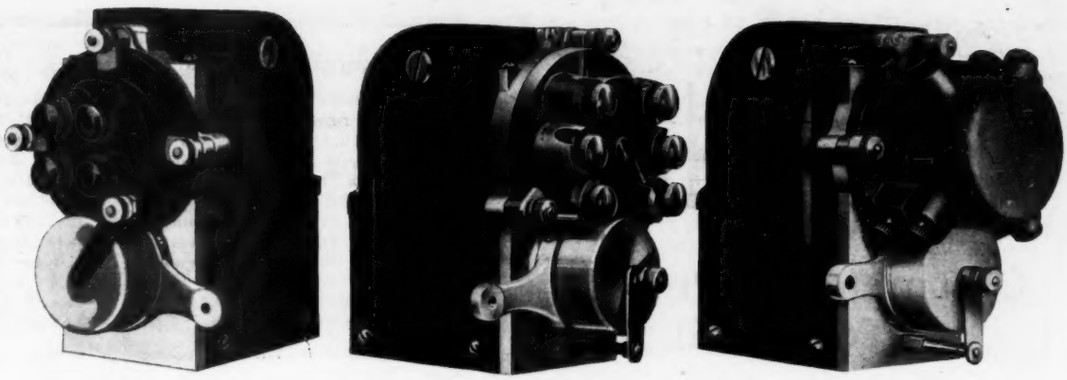


Fig. 7—Models 40, 60 and 80 Dixie magnetos for four- six- and eight-cylinder engines

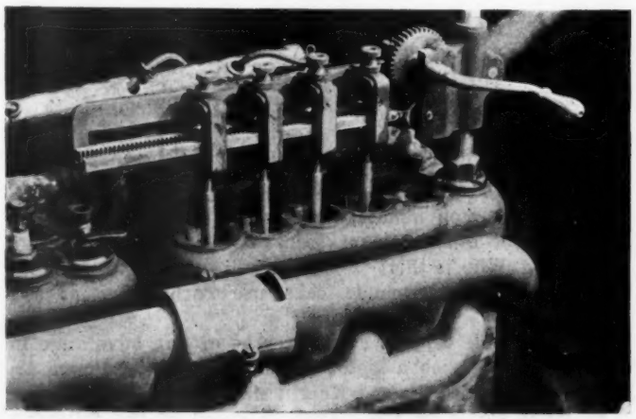
The four automobile models are designated 40, 60, 80 and 120 for four-, six-, eight- and twelve-cylinder engines.

Multiple Valve Grinder

A simple valve grinder by which four valves can be ground at one time and which device can be rigidly attached to any motor in a car, has been brought out by Knepper and Wright, Detroit, Mich. Turning the handle at the right is all that has to be done in grinding the valves. This imparts a back-and-forward movement to the horizontal rack, which in turn gives a short back-and-forward movement to the four screw drivers which engage in the slots in the valves. Additional pressure on any valve can be had by the knurled adjusting screw on the top. As shown the device is attached to a spark plug hole but this is not the only method, for special devices are made to suit different types of engines and those with detachable cylinder heads can be dealt with just as readily as the type illustrated.

Naturally this tool is intended more for use in garages and repair shops than by the private car owner, but its wide range of adjustability and the consequent ease of attachment to almost any engine ought to enable valve grinding to be performed at a slightly cheaper rate; a distinct advantage to the owner in these days of many valves.

One of the great advantages of a tool of this kind is that it can be relied upon to give an even pressure at all times. Sometimes with the hand method the pressure upon the bearing seat will be much greater than at others and an even seat for the valve is not gained as quickly as with the mechanical method.



Knepper multiple valve grinder ready for action

Belgian Armored Cars Most Efficient

(*Continued from page* 10)

section cans in which reserve gasoline is carried, also the special lubricating oil cans, and has special grooves to receive tires. Along the lower portion of the two sides are a series of lockers—six on each side—with a door on the outside. These lockers contain various small parts, stowed away systematically, and as readily accessible as the stock in an automobile store. Each compartment has its own lock, and in addition a catch to prevent the door flying open if the attendant fails to lock it. The store keeper maintains a complete list of the parts in his possession; as each part is given out he records the fact in his storebook and arranges for replacement to be sent to him when a certain minimum has been reached. He thus knows at all times, without going through his lockers, what material he has in stock.

The Armored Cars in Action

An armored car corps in action is a thrilling sight. Suppose, for instance, a village held by the enemy has to be attacked. The cyclists are first sent forward to reconnoiter, draw the enemy's fire, ascertain his strength and the condition of the roads. During this time the cars are concealed in the rear, and the motorcyclists are used for carrying dispatches from the advancing cyclists to the corps commander at the rear. When the attack is decided upon, the corps may be divided into two sections, each one of which has instructions to dash through the village by a different route. On such a dash it is probable that the quick firing guns will have to be employed, although the cannon can be brought into operation immediately if it is needed for attacking a stronghold. A charge through a village is usually made in staggered formation, one car being on the right hand side of the road, the next one 50 yards to the rear on the left hand side, and the third again on the right. Unless the village is scientifically fortified, it is practically impossible for an infantry force to stand before a raid of this nature. Comparatively little use can be made of armored cars in trench warfare, but in an advance or in covering a retreat they are invaluable. In the case of a retreat, for instance, their extreme mobility enables them to hold a position until overwhelming forces are brought up and to get away at the last moment with very little fear of capture. On the other hand, retreating forces of the enemy are most seriously harassed by cars which can dash in, attack and retreat at 40 miles an hour.

The Rostrum

Communications

¶ The editor of the Rostrum is anxious to secure from car users and others, communications dealing with the overcoming of difficulties in making repairs and in the numberless other phases of every-day automobiling. This department is mutual and is a common ground upon which an interchange of ideas and opinions can be made as freely as in the clubroom.

Inquiries

¶ The purpose of the Rostrum department is primarily to aid in the solving of motorists' problems. Readers of THE AUTOMOBILE *are requested to allow our editorial staff aid in the solution of difficulties as they arise and perhaps through this assistance reduce the cost of upkeep of their cars and gain a useful knowledge in the economical phases of the vehicles.*

Carbureter Is Probably Too Small

EDITOR THE AUTOMOBILE:—I have a model 16 Buick equipped with a model L Schebler 1 1-2-in. carbureter which is causing me considerable trouble. When the engine is running slowly, it works fairly well. I can open the throttle quickly and the engine immediately picks up and does not skip, but as soon as I start up a hill it begins to skip even with a half throttle and when it reaches the speed of 38 miles per hour, it will skip, spit back through the carbureter and fire in the muffler. I have had the dials set at all points, sometimes adjusting it so it will work good for 10 or twenty miles, but it will be almost impossible to do anything with it. I think the float has been moved, as it is 7-8 in. from the top of the bowl. What suggestions can you offer on this? C. A. B.

New York City.

—It would seem that you have changed the carbureter on your model 16 Buick from the original Schebler D, which was used for standard equipment, and put on a 1 1-2-in. size model L. If this is the case, you have too large a carbureter on your car. The proper size for you to use on model 16 Buick would be 1 1-4 in., that is, the 1 1-4-in. model L.

The carbureter being too large would require a large amount of heat to keep it from loading up when the motor is running slowly. This, as stated, is due to the large size of the carbureter. The correct level of the cork float should be 1 1-16 in. from the top of the bowl when the float valve is closed.

Relative to the motor missing at a speed of 38 miles per hour, it would be very likely that this is due to ignition trouble. The breaker is not working properly perhaps at that speed.

Chains Probably Not at Fault

Editor THE AUTOMOBILE:—Please tell me if the slack can be taken out of the chains which run the cam and magneto shaft on the Paige 1914 model 36.

2. What remedy can you suggest for a rattle which occurs when the clutch is disengaged? It is of the multiple-disk type with cork inserts. K. M.

Eunice, La.

—While the drive chains used on the model 36 Paige motor will stretch to some extent, they will not do so sufficiently to cause any trouble while the motor is running smoothly, as there would be a steady pull on the chain and hence no possibility of their causing a slap.

If trouble develops with the pump drive chain, it would be more apt to be caused by the pumpshaft bushing becoming worn, which would allow extra slack in this chain, and the remedy therefore would be in the installation of a new bushing. If the trouble is in the generator drive chain there is no way by which this can be adjusted other than by removing the bolts which fasten the generator to its supporting bracket, elongating the hole and moving the generator out slightly. If this were done care must be used in resetting the generator so as to get same so that the chain will be properly aligned.

The chain driving the camshaft is a shorter and much heavier chain than the other two and, in fact, is much heavier than is necessary for the work which it has to do and should not ever cause any trouble.

2. The clutch rattle may possibly be caused by the prongs on the shifting bar not being of equal distance away from the thrust bearing. This can be determined by inserting a feeler gauge between the prongs and the bearing and if one is found to be closer than the other, the distance should be equalized by bending back the one which is closer.

There is a tendency for a rattle to occur in this type of clutch when it is disengaged, especially when coasting on a down-grade or when driving over a rough spot, but this can be overcome by bringing the shifting lever into neutral position and allowing the clutch to remain engaged, especially while coasting down a grade.

Water Boils at Higher Speeds

Editor THE AUTOMOBILE:—The following question has puzzled every one whom I have asked, and I will appreciate a word from you relative to this question.

I have a Buick roadster, model 30, which travels well up to a speed of 20 miles per hour, but when the speed is increased, the water boils so fast that the radiator is soon emptied and consequently I have the usual trouble which accompanies a heated engine. The pump is in good shape, new heavy hoses all around. The radiator was opened up and all the tubes were free and also the tanks are in good shape. Circulation seems to be good. The cylinders have recently been burned out with oxygen and I am at a loss to know what is causing the trouble. H. B. TREVOR.

Buffalo, N. Y.

—It would seem that your trouble must result from one of two causes: First, an improper setting of the spark, which can be corrected by advancing the magneto, or second, by a collapsing hose connection between the radiator and the water pump, which, at 20 miles per hour or over becomes closed due to the suction of the pump. This latter cause seems to be the most probable and it can be remedied by winding a piece of wire into the shape of a coil spring and inserting it tightly into the tube, thus holding the wall against collapsing under the suction of the pump.

When a Motor Stops Quickly

Editor THE AUTOMOBILE:—Some engines such as the Pierce-Arrow, stop almost immediately after the switch is cut off, while other engines seem to lose their momentum gradually. Why is this?

2—What American-made cars use carbureters of the Claudel type?

3—Would this type of carbureter be of any advantage in connection with such a motor as the Packard 48, Pierce 48, Stevens-Duryea, or Stearns-Knight six?

4—What would be the maximum speed of the following cars geared up and in running trim: Packard 48, Pierce 48,

Stearns-Knight six, Stevens-Duryea and Peerless 48?

5—What is the maximum speed of the Rolls-Royce, Packard 48, Pierce 48, Stearns-Knight six, Peerless 48, Stevens and Simplex 75?

6—Please give specifications of the Packard Twin Six. Also, speed, fuel consumption and weight?

New Haven, Conn. T. B. S. D.

—When the switch is cut off on an engine, it is merely a matter of bringing to rest the moving parts which are no longer propelled by the explosion of the gases in the combustion chamber. Only one influence is probably great enough to be considered as the opposing factor to the movement of the motor, and this is the internal friction. When this has exerted its influence to such an extent that the motor is unable to turn itself over against the compression of the cylinders, it will come to rest. The compression is not an opposing factor unless the momentum is insufficient to carry the motor over top center, because when it is carried over top center the expansion of the compressed air gives up practically all the power which was utilized in compressing it. If the compression is exceptionally heavy, then the speed does not have to be reduced as far as it would if only a light compression were used, before the engine will be unable to turn itself over the dead point. With these considerations, it will be easily seen that a motor with tight bearings, tight piston rings and high compression will come to rest much quicker than one which has the opposite conditions. Of course, a gas-tight motor is more efficient under running conditions than one which is too free.

2—No American cars are regularly equipped with the Claudel carbureter.

3—THE AUTOMOBILE has never carried out any experiments with this carbureter on the cars you mention, and since this is the only way of determining the results, no information can be given you on this matter. It might be possible that the companies referred to have experimented on this carbureter on their respective makes, and would be willing to give you the desired information.

4—You do not mention the gear ratio in questions 4 or 5. Under most advantageous conditions it is difficult to fix a maximum speed for any car as it will vary, even on the same make. Under touring conditions, any of the cars you mention should be able to do 65 miles per hour.

5—Complete specifications of the Packard Twin Six will be found in THE AUTOMOBILE for May 27, 1915, page 933.

Advanced Spark Causes a Pound

Editor THE AUTOMOBILE:—What is it that causes the tapping sound in a motor when the spark is advanced too far, when motor is laboring? Why is it that this happens when a motor is new and the pistons, wristpins and rings are absolutely tight and perfect fitting? Is it a piston slap?

Newark, N. J. L. A. MILLER.

—Very often with the spark advanced too far, the pound given by the motor is simply the impact of the working parts transmitted to the volume of exploding gas in the combustion chamber. This is communicated throughout the motor and the resonant qualities of the metal in the motor permit a pounding effect to ensue. With pistons that are any way loose at the bottom, the reversed power causes a slap as you mentioned, but even without the piston slap the pounding noise would be in evidence. The reason for this jarring is evident from a diagram which explains the opposition of the two forces acting upon the motor during pre-ignition. These are, first, the tangential force on the crankpin and, secondly, the downward thrust of explosion along the connecting rod. Referring to Fig. 1, the tangential force *A* is tending to force the moving parts in the direction of the arrow and the thrust along the connecting rod is tending to act in the direction *EB* at an angle to *EF*, the axis of the cylinder. *CD* is the projection of the horizontal plane through the crankpin. To the right of the same illustration is shown the parallel set of conditions when ignition takes place beyond upper dead center. In the latter case it will be noted that the forces represented by the arrows *A* and *B* or, in other words, the tangential and thrust forces are in the same quadrant as regards the vertical and horizontal planes. They are therefore acting with each other and not against each other as at *A* and *B*.

With the present tendency of putting the piston rings at the top and none at the bottom, there is sometimes a slap caused by the oscillating of the piston about one of the upper rings, brought on due to the reversal of power to pre-ignition. It must be remembered, however, that even with the best fitting motors, a charge pre-ignited will find any place where there is backlash, as the reaction even carries through the timing gears, valve mechanism, etc.

Knock Due to Over-compression

Editor THE AUTOMOBILE:—Would be pleased to have your opinion on the following: A 1913 Ford has been run about 8,000 miles and it has a knock which seems to be in the two front cylinders. It knocks when the car is running on the road or when it is standing still with the motor running. All the bearings have been carefully gone over by two different garagemen but neither could find the trouble. It does not knock any harder when car is climbing a hill than it does when running on the level. When the spark is retarded, the knock can scarcely be heard.

Johnstown, O. W. D. DAVIS.

—Although it is impossible to judge the source of this knock from the particulars which you give in your letter, it would seem very possible that for some reason or other the motor has too much compression. If the cylinders are removed and a fiber gasket fitted between them and the crankcase it is possible that the knock will disappear.

Oil Not Suitable for Two Purposes

Editor THE AUTOMOBILE:—Is there a six-cylinder roadster of standard make that weighs under 2,300 pounds?

2—Is there an underslung roadster made which has the multiple disk clutch running in oil?

3—What is the objection found to transmission gears built in and receiving the same oil as the cylinders? Is there any great objection to this oil as used in crankcase as a lubricant to the transmission gears?

4—What final ratio is considered best on cars with 33 by 4

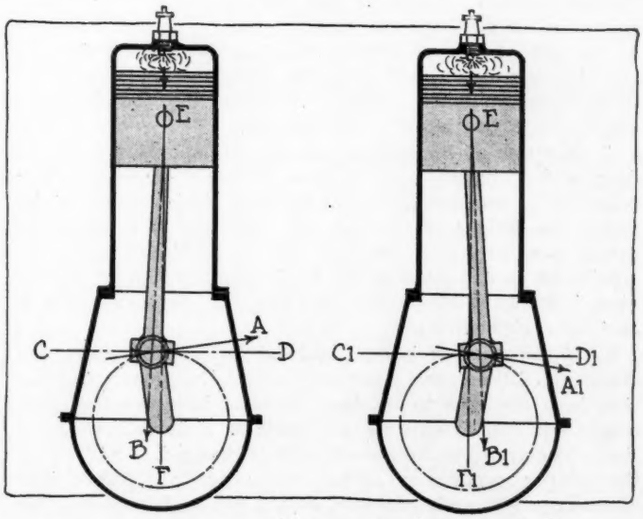


Fig. 1—Diagram showing direction of forces on preignition

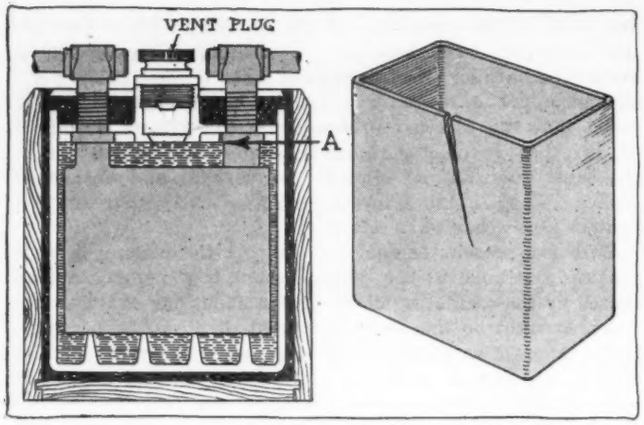


Fig. 2—Section through Willard battery and a cracked jar which sometimes causes a leak. Battery should be filled to A

tires and what speed should be obtained from this ratio?

5—Can the low speed of an ordinary gearset be changed to a lower ratio without changing the two higher speeds?

6—Is there a serious objection to mixing cylinder oil with the gasoline and is there any advantage of it as a lubricant to the cylinders?

7—What may be the injury caused by using over tension on clutch springs? Is there an excessive pressure brought to bear on the crankshaft bearing by using tight clutch springs?

8—Is there a satisfactory fluid that can be inserted into the inner tube which will take the place of air?

Graysonia, Ark. AUTOMOBILE STUDENT.

—We have no record of any standard six-cylinder roadster weighing under 2,300 pounds.

2—No more underslung cars are listed among the 1915 models.

3—The main objection to this is that the lubricant which is suitable for cylinders is not suitable for gears. Gears require a viscous lubricant which clings to the surface and provides a substantial film between the teeth. The gear wheel must be able to carry the oil around with it. In the cylinder the oil requirements are entirely different. The difficulties of high temperatures must be met with and since an entirely different set of conditions are to be faced the oil will naturally have to be different if it is to provide ideal lubrication. Very often makers in the past have connected the gearset to the crankcase so that the oil in the latter worked its way to the former and vice versa. These makers have gradually abandoned the method however, as the oil from the crankcase was not considered to be ideal for the gearset. Another great objection to the use of the interconnected gearset and crankcase is that the car user would often put heavy oil in the gearbox with the result that it would work its way into the crankcase and cause carbonization of the cylinders.

4—The size of the tires is not the all-important factor in determining the proper gear ratio as there are many other points to be considered, such as the most efficient speed of the motor, the weight of the car, etc. These may so alter the proper gear ratio that the mere size of the tires becomes insignificant in determining the final reduction. With this in view, it is impossible to state that any given final reduction is best for a given tire size.

5—If the gearbox is well laid out in the first place, the changing of the lowest gear ratio alters the proper progression from one gear to another. In most instances the gearbox is laid out on either a geometric or arithmetic progression. Therefore, if the lowest ratio is changed, it will throw the proper progression from one gear to another into disarrangement and therefore, should not be done unless the gearbox is incorrect in the first place.

6—There is no objection to mixing cylinder oil with the gasoline. It serves as a lubricant to the cylinders and is claimed by many to be an advantage especially as regards two-cycle motors.

7—If the clutch is properly designed with a thrust bearing, there will be no pressure brought to bear upon the crankshaft bearing by the clutch springs. The big objection to too tight an adjustment on the clutch spring is that it will make the clutch grab instead of giving it a gradual engagement.

8—There are many fluids which have been inserted in the inner tube to take the place of air but none of them have come into any extended use, the main objection having been that they were not resilient enough or that they crumbled under the stress of rough roads.

Lever Slips Out of High Gear

Editor THE AUTOMOBILE:—I have had some trouble with slipping out of high on my Cole eight while going down grade and could probably remedy it if I knew what to look for. What would you suggest? H. W. KIMBALL.

Haverhill, Mass.

—It is very likely that the lower end of the control lever has been fitted too tightly against the shifting bars in the gearset. By removing control lever and reducing the diameter of the boss which enters into the shifting gears your difficulty should be eliminated.

Lincoln Highway Office Is in Detroit

Editor THE AUTOMOBILE:—Can you tell me where I can get information on the Lincoln Highway, the route and distance to San Francisco?

Montrose, Mich. C. A. WALKER.

—You can get full information on the Lincoln Highway by addressing the Lincoln Highway Assn., Free Press Bldg., Detroit, Mich.

Welding May Save Crow-Elkhart Cylinder

Editor THE AUTOMOBILE:—I have a Crow-Elkhart car and the motor block is broken so as to be beyond repair. I wonder whether you could tell me where to get parts for it. I also need a piston, connecting-rod, wristpin and bushing and connecting-rod bearings.

Newark, N. J. H. J. ANDERSON.

—Parts for the Crow-Elkhart car can be secured from the Puritan Machine Co., Detroit, Mich. Before giving up the cylinder casting however, you should take it to a good welder and have it gone over. Many an apparently hopeless job has been repaired by the welding process.

To Find Leaking Battery Cell

Editor THE AUTOMOBILE:—I have a 1912 Cameron runabout which has given me trouble with the differential gear. The cogs in the small differential pinions have broken off three different times. The car is equipped with 32-in. wheels, but was intended to use but 30-in. wheels.

1. Can you explain how I can remedy this trouble? Where can I get repairs for this car?

2. How can you tell which cells in an L. B. A. storage battery are leaking?

3. Is there a paint or chemical which will stop the acid from eating away the metal with which it comes in contact?

E. WEAVER.

Attica, O.

—As THE AUTOMOBILE has no record of anyone who is selling parts for the Cameron car, you will have to have new gears made or have the teeth repaired by having new teeth cut and fastened to the old gear. It will probably be

cheaper and better to have new gears made by a factory equipped to do this work and in all probability it will have to be handled by one of the large orphan car specialists.

2. The only manner in which you can tell which cells of a battery, Fig. 2, are leaking would be to fill them all to the same level with distilled or clean rain water, then after allowing the batteries to stand in a dry place for twenty-four hours, look at the height of the electrolite in the different cells and if there is any difference in the level, the one which is lowest is the one which is leaking.

3. The material used for protecting wood and metal against the inroad of acids, such as is used in storage batteries, is lead or lead paint.

Double Magneto for High-Speed Work

Editor THE AUTOMOBILE:—I have a 45 foreign Fiat T-head motor and would like to install a two-point ignition. Would you advise me how to couple same with a Bosch three-magnet H. T. magneto? Also, how much power would this give? What would be the extra stress on the engine and whether it would be able to stand same?

2. Can a steering wheel be changed from stiff to adjustable rake, and how?

3. Could you give me a diagram of the oiling system on the 1909 Fiat?

4. Could you tell me where I can obtain a book on construction and care of the 1909 Fiat or a car of similar make? The Fiat Co. could not furnish me with same.

5. Please give me the strongest solution to place just in the cylinder jacket, not in the radiator. Would lye do, and how long should it stand to loosen rust and corrosion?

Jersey City, N. J. A. MECHANIC.

—If you intend to use the car for high-speed work, two-point ignition would be very satisfactory and can be secured in two ways. First, by coupling the plugs in multiple by means of special plugs for the purpose, and secondly, by changing the magneto for one with a double distributer. If you intend to use the car for speed work it would be better to change the magneto, but for ordinary work it would hardly be worth while to go to the expense of changing it.

2. The steering wheel itself cannot be changed, but you no doubt refer to the column or post, which can be lowered or raised to any desired position.

3. THE AUTOMOBILE has no diagram of the foreign Fiat on hand. As the American car is quite similar in this respect, however, this diagram is given instead in Fig. 3.

4. A book on the care of the American Fiat can be secured from the Fiat Repairs Co., 640 West Fifty-eighth Street, New York City. This is practically the same as the foreign car.

5. The best way to remove the rust would be to take the cap from the top of the cylinder and scrape the rust from the water jacket space.

Piston Slap May Cause Knock

Editor THE AUTOMOBILE:—As a service man I have found in repairing and adjusting a motor, a knock which I cannot place or eliminate. In the first place, when the car was brought in, there was no knock. It was brought in for more power. We put in new patent rings, scraped carbon and ground in the valves. After this was done the knock came. It is really a tap, almost like a low tappet sound. We then took out the valves, thinking the stems were sprung. We had them all trued and faced off, then ground them in again. The knock was still there. We then put in new wristpins and bushings. Still it was evident. Last of all we raised the cylinders with fiber plates 3-16 inch, but to no avail. Where is the knock?

Holyoke. Mass. H. O. S. S.

—You have not mentioned piston slap which is a possibility due to the fact that the pistons might tend to oscillate about the patent rings in the top of the cylinders and slap at their lower end. Another possibility is that the rings do not fit tightly enough in the piston grooves thereby giving a backlash at the end of each stroke. The crankpin and crankshaft bearings also should not be overlooked.

Power Not Accurate by Formula

Editor THE AUTOMOBILE:—Can you give me a way to calculate the power of motors to determine the exact brake horsepower?

Jonesville, S. C. H. W. L.

—It is impossible to calculate accurately the horsepower of a motor by formula. If this were so, the formula would have to include every possible variable, because if it did not, it would be incorrect for every value of that variable except one. Since the power developed by a motor includes such things as cam contours, manifold and port designs, shape of combustion chamber, tightness of piston rings, frictional horsepower, losses through the bearings, etc., it is obvious that a formula which can furnish brake horsepower is impossible.

Three Possible Causes for Knock

Editor THE AUTOMOBILE:—I drive a 1911 Hudson 33 which is in good order and will run smoothly and quietly if I keep it at a steady speed of from 16 to 25 miles per hour, but after stopping it will knock until I gain spee dagain. The car runs with this knock in running slowly or in starting. Retarding the spark makes no difference. Can you suggest a remedy?

Mansfield, Mass. S. F. FRENCH.

—There are three possible causes for the knocking. One, excess of carbon; two, a loose connecting rod; three, a loose bearing. First try removing all the carbon by having it scraped or burned out, and if this does not cure the trouble, the motor should be taken down and the bearings inspected for looseness. What is known as a gas knock often develops from a badly adjusted carbureter.

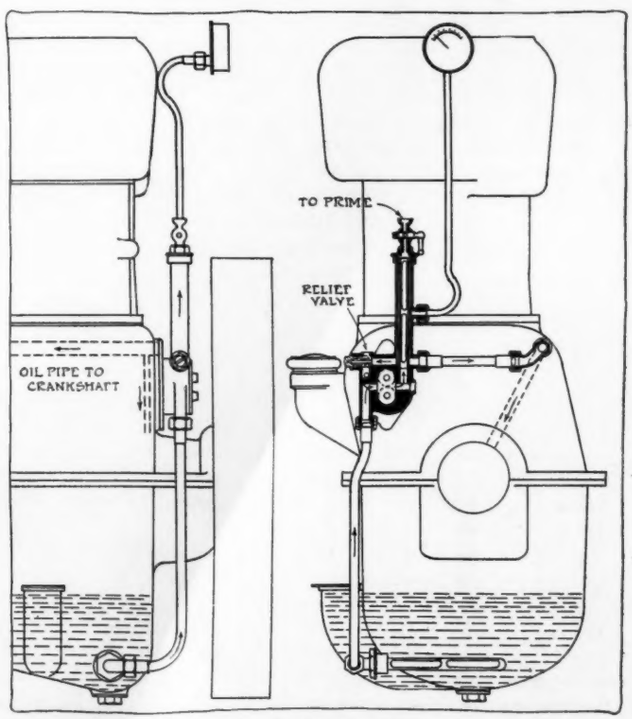


Fig. 3—Diagram showing the oiling system used on Fiat cars

ACCESSORIES

Kemco Electric Starter

THE Kemco Electric Mfg. Co. has brought out an additional unit for starting which can be used in connection with the fan type dynamo. This makes up a two-unit starting and lighting system which can be fitted to cars not originally equipped with electric cranking. The cranking motor is designed to fit on the front of the car, replacing the hand crank, and to duplicate the action of hand cranking. When the switch button is pressed the same starting clutch as would have been employed with a hand crank is slipped into engagement with the crankshaft and the motor is spun until it fires. When the engine starts under its own speed the starting clutch is automatically thrown out in the same manner that the hand crank is thrown out of engagement when the engine starts.

The system works at 6 volts and should be installed in connection with a 100-ampere hour storage battery. The starter is made in two different sizes so that all classes of cars are covered. The gear ratio between the armature of the cranking motor and the crankshaft is 9.5 to 1.

Some of the special electrical features in connection with this machine are particularly its automatic action in engaging to the crankshaft by means of a magnetic control when the starting button is depressed. The release is altogether independent from the solenoid coil which engages the cranking motor with the crankshaft, being due as explained, to the declutching of the cranking motor. The starter is controlled by the car operator by a button depressed by the foot. It can be applied to practically any make of car by means of universal fittings which attach across the front of the frame and are adjustable in every possible way so as to fit the car properly. With this arrangement no drilling or machine work is necessary.

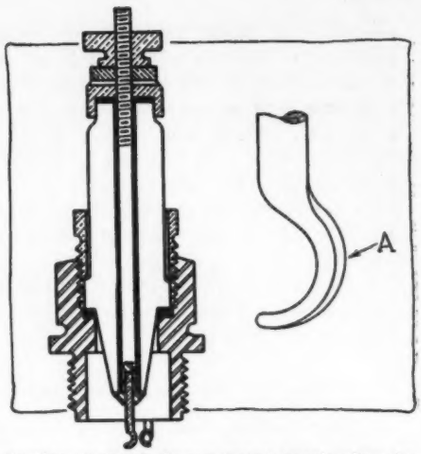
In connection with the new cranking motor there is also brought out a positive drive for the Kemco fan generator. This gives an improved two-unit starting and lighting system with which a car can be completely electrically equipped.

The overall dimensions of the cranking motor are 9 by 7 inches. Its weight is approximately 33 pounds and since the weight of the generator is 11 pounds, the two principal units total less than 50 pounds.

A special two-unit electric starting and lighting system for Ford cars has also been brought out, operating on the same principle as the larger one but adapted especially for the Ford. The entire outfit, including the electrical fittings, lamps, side lights, tail lights, wire, etc., is $95 for the Ford, $125 for medium size cars and $150 for large cars.—The Kemco Elec. Mfg. Co., Cleveland, O.

Spoon-Point Spark Plug

Of conventional design, except for the shape of the terminals, the material of which is a new alloy, the Spoon-Point spark plug has entered the field. The terminals are spoon-shaped, as may be seen in the accompanying illustration, the spoon being 3 millimeters in diameter, the convex surface about 1 1-2 millimeters above center, and the concave surface about 1 millimeter deep, giving an unusually large sparking and wearing surface. The inside convexity of the terminals is claimed to prevent the accumulation of oil and carbon between the terminals, and produces a flat circular spark which is not diffused, but hot and effective, while the concave construction affords a drain for oil.



Section through Spoon-Point spark plug, together with detail of spoon-shaped terminal

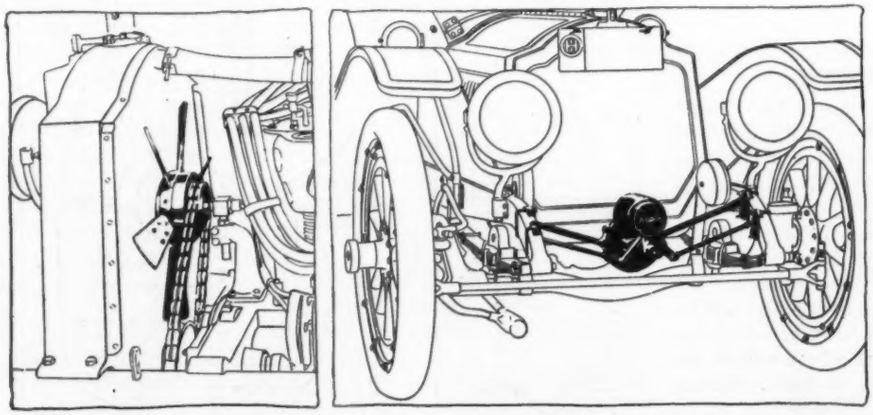
A feature of this plug, in addition to the distinctive shape of the terminals, is the white alloy manufactured after a secret patented process which is used for the terminal spoons. This alloy is somewhat lighter in color than platinum and is claimed to be very durable and especially suitable for spark plug work, remaining bright under the most intense heat, regardless of the amount of oil used in lubricating the motor. The porcelain to be used in Spoon-Point plugs is also a special process product, patent application now pending. Ordinary porcelain is being used until this patent is granted. The manufacturer guarantees these plugs and will replace any defect in workmanship or material, free of charge. Plugs will sell at retail for $1 apiece.—Spoon-Point Spark Plug Co., La Porte, Ind.

Lock Switches

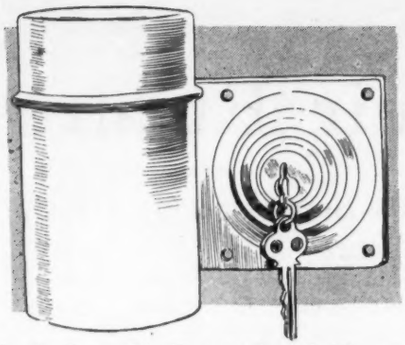
Master vibrators are popular attachments for Ford cars and the L. G. S. is a combination of vibrator and lock switch. The switch is a Yale lock job and nothing can be done with the ignition as long as the lock is thrown open. The same switch lock can also be had without the vibrator, and the attaching screws are so arranged that they cannot be withdrawn when the current is locked Off. This effect is obtained by making the heads of the screws accessible through holes in the cover plate, and when the key is turned pieces of brass are drawn across the holes. The switch alone costs $3 and the switch combined with master vibrator $12.—Bass-Moody Co., Peoria, Ill.

Universal Test Clips

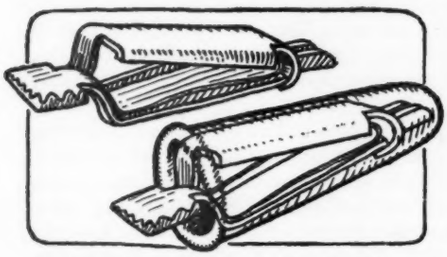
For making quick connections the Universal test clip has been brought out to fill the field in ignition and battery charging service. These are manufac-



Left—New positive drive for the Kemco fan generator. Right—Kemco starter, which can be used in connection with the fan type generator



L. G. S. combination master vibrator and lock switch for Ford cars



Universal test clips for battery charging

tured under different numbers pertaining to different types and examples of their construction, types 8 and 9 being illustrated herewith. The clip generally used by the automobile trade is No. 13-A, a 20-ampere lead plate design used chiefly for charging the batteries which come with the electrically equipped gasoline cars. Automobile manufacturers who receive these batteries in quantities line them up on great long tables and by means of jumpers fitted with Universal test clips connect the batteries up in series for charging. The jumpers are made by taking a piece of lamp cord 15 to 18 inches long and fitting the test clips on each end.

The battery charging stations and garages which have occasion to recharge these batteries also find use for the clips as a quick and ready means of making a connection. The teeth of the clips will bite through the corrosion on battery terminals, thus making it unnecessary for the garage man to clean the terminals.—R. S. Mueller & Co., Cleveland, O.

Spranger Rim and Wheel

This is a form of wire wheel which has the demountable rim feature and comprises a standard form of rim holding the tire, which rim fits onto a steel channel felloe to which the wire spokes run. Pairs of lugs are welded at equally spaced intervals around the inner surface of the rim, there being either three or four sets, depending upon the size. These lugs fit into slots cut in the channel sides of the felloe and make the firm attachment of the two parts. On the felloe is the locking mechanism shown in Fig. 1. The dogs A which are pivoted to the felloe may be swung outward by the threaded nut B on the bolt C. When the rim is in place, the bolt is turned and the dogs then enter slots cut in the adjacent sides of the lugs on the rim, preventing the latter from coming off. To prevent the bolt from turning, a flat piece of steel goes over the head and is held in place by its springing into a small indentation in the channel side of the felloe.

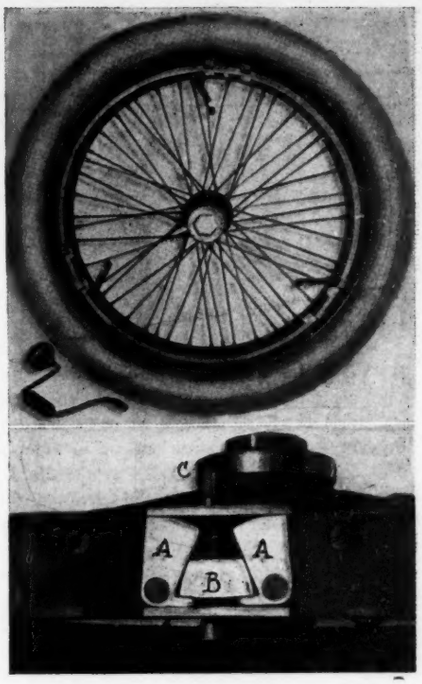
With this demountable feature, it is pointed out that the wire wheel is as simple to have as the wooden type. It is not necessary to carry extra wheels but simply the rims as would be the case with wood types. However, the Spranger concern makes this wire wheel with the demountable hub feature as well, the locking method being by means of two hub caps screwing on in opposite directions and thus holding each other in place.—Spranger Rim & Wheel Co., Detroit, Mich.

Johnson's Wax Body Polish

With the idea of meeting the need for a protection for the high finish of the body, hood and fenders of all sorts of cars, S. C. Johnson & Son are manufacturing a hard, dry wax, which they claim prevents both dust and water from sticking to the surface. This wax has long been used for polishing woodwork, floors, furniture, pianos, etc., which suggested to the makers that its quality of holding luster indefinitely because of its hard, dry impervious nature, would render it of value for automobile work. The wax is said to cover up small scratches, an advantage being that it is said to produce as fine a finish over varnish of poor quality as over that of high grade, the wax acting entirely independent of the original finish on the car, and being equally effective as a protective agent, irrespective of the condition of the surface to which it is applied.—S. C. Johnson & Son, Racine, Wis.

Steering Steady

To prevent the sidesway in a Ford car due to the construction of the spring assembly wherein both front and rear springs are hung between two shackles or links that are free to move sidewise, is the purpose of an invention known as the L-A Steady Steerer. It consists of a strut as shown in the illustration which

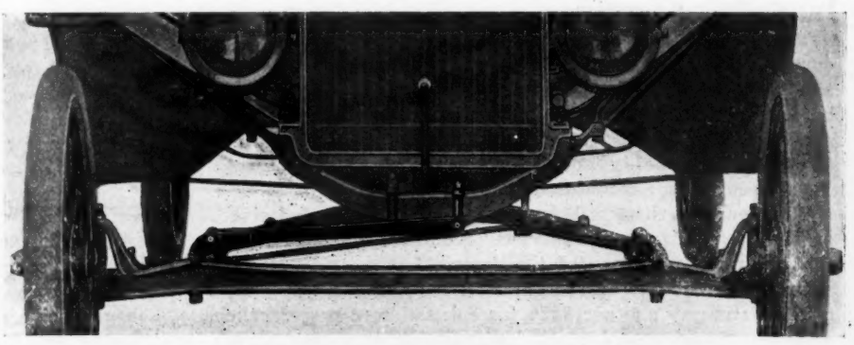


Upper—Spranger wire wheel with demountable rim. Lower—Locking mechanism

is so connected between the body and the axle as to hold the latter in a position that will cause the road wheels to remain in a straight course set by the steering wheel. It accomplishes this by drawing the axle sidewise on upward movement, and by pushing it on downward movement, keeping the relation constant.

This is advantageous because, it is pointed out by the maker, whenever the Ford machine not equipped with the steerer receives an axle side pull sufficient to overcome the weight of the body, which weight ordinarily holds the body, central on the chassis, then the axle moves sidewise in exact proportion to the force exerted.

In application, the end of the strut attaching to the frame is fitted with a spring bolt to take the place of one of those ordinarily attaching spring to frame, while at the axle end it attaches to the regular link bolt which connects between the link and the spring shackle.—Lockwood-Ash Motor Co., Jackson, Mich.



L-A Steady Steerer as it appears when mounted on a Ford car

Four Cylinders and Their Future

Is There a Market for the $1,000 Four?—Some Thoughts Suggested by Gossip on the Recent Society of Automobile Engineers' Trip

By A. Ludlow Clayden

THE past, present and future position of the four-cylinder automobile in America has been a favorite subject of discussion among engineers for several years, but on board the steamship Noronic on the recent summer session of the Society of Automobile Engineers it seemed to rival any other topic when three or four engineers got together between the meetings. The writer, having taken a share in several such informal conferences, finds, after a week's reflection, that there arise upmost in his recollection a few leading ideas on which agreement seems fairly general.

First of these, without a doubt, is that the four-cylinder motor has seldom, if ever, been given a proper chance to show its quality, because it is in isolated instances only that it has been made with an eye to anything but low production cost.

Making a Cheap Motor

Now, there is only one way, as a rule, to discover or create an inexpensive *good* article of any kind and that is to make it good first and cheap afterwards. Since engineers have discovered how to make good sixes and good eights, to say nothing of good twelves, hardly anyone has had the time to make a four along similar lines, and it is safe to say that nobody has, till recently, given deep attention to the possibility of creating a really good four-cylinder motor that could find a place in a $1,000 chassis.

There are, of course, motors which are used in cars of about this price whose manufacturers would consider them good motors, and they *are* good from several viewpoints; but they are not modern designs of the high-speed, high-efficiency type directly comparable with the eights. We have nothing on the motor market that resembles one-half a Cadillac, for instance.

There are some big fours of excellent design and comparable with any modern work at home or abroad, but these are in fairly high-priced cars and are not to be bought for assembly manufacturing. Yet, considering what we now know concerning the cost of making a highly efficient eight of dimensions approximately 3 by 5 in., it seems reasonable to suppose that an equally well made four *could* be produced at a price which would make possible its incorporation in a $1,000 car.

Buyer's Taste a Question

It is obvious that such a motor would give us only about one-half the power of a 3 by 5 eight or two-thirds that of a six of similar dimensions, though in practice the power should be a little in excess of this proportion at equivalent crankshaft speeds, so we come to the point of wondering whether the power available is enough for any sort of automobile that the American user would accept.

Question: Is there still magic in the words six and eight, or is it the absence of the kind of car we are considering that makes the absence of the demand?

Or putting it another way: Will the man who now uses a $720 four pay another $250 for a little more power, much smoother running and much better finish on a car of the *same size.*

The writer, realizing how greatly conditions differ both as to service and to public taste on opposite sides of the Atlantic, always hesitates to bring in any argument based on European experience solely, but in this connection it is not out of place to just mention the fact that the well made, small size and rather costly car was an experiment when it came on the European markets. Europe has not had any good $1,000 cars to carry four people, but that is a matter of quantity only. There are several British and French automobiles of four-passenger capacity which are regarded as good material, workmanship and finish, that could easily be sold for this price if they could be made in thousands instead of hundreds. Now, the British and French buyer was very skeptical about these cars when they first appeared, very skeptical indeed, and it took experience to show him that their wonderful economy in upkeep combined with better performance than that anticipated made them desirable things to own. Might not the same thing reasonably happen here?

Who?

At this point comes the greatest divergence of opinion. The writer confesses to an open mind and merely observes that the engineers divide into two main camps, those who say that the American user thinks more of size than anything else, and those who say that "they would like to see some one else try out the scheme."

In estimation of the buyer's predilections the salesman ought to know, but it is the experience of many different sorts of business that the salesman often is too conservative. He hates to change a thing which is going moderately well for fear it should not be approved. He is a little loth to gamble on a new article.

Thus one may query the estimate of the public mind.

Quality Beats Quantity Sometimes

Taking the broad view, there are many things which the American man or woman likes to have of the highest possible quality regardless of cost. In fact, does not this apply to all the surroundings of daily life, to furniture, to homes, to food, to clothes even? There is no rush for the largest house, the largest chair or the widest menu that a given price will buy, so why should there be regard for bigness only in automobiles?

Here no doubt many of my readers will say, "That may be all very well for other places, but size for money has been the manufacturer's cry so long in the automobile field that it is too late to try any other tack." Well, it may be so, but there are many engineers and many manufacturers who do not seem to be so sure about it.

Precedent Broken by Eights

Perhaps the coming of the multi-cylinder motors after we thought that everything had settled down to sixes and fours has shaken convictions. Perhaps it was the ready way in which expensive cars of new construction were seized upon by the motorist, which has disturbed the tranquil attitude of two years back, but it *is* disturbed and there are chances

now for many novelties which had no chance till something happened along to shake the automobile industry to its very foundation; and, let it be remembered, the ultimate user, the customer, is a part of the industry, just so soon as he buys his first car, and he is shaken, too, with the rest of the trade.

A Household Parallel

America of all places in the world is the last where conservatism of the buyer need be considered as paramount, for in no other country on the globe are people educated to the point where the rapidity of advance of science and manufacture is realized. There are literally thousands of petty, labor-saving household tools and utensils in universal use in U. S. A. which could not be sold in any other market without an educative campaign spread over years.

Does this not really mean that if the manufacturer has something he knows is good, something which will give satisfaction to the man who buys it, it will take less effort on his part to make the buyer fall in with his views in America than it would anywhere else? If this is true, then it is not really necessary to think about the buyer and his supposed tastes, since it is possible to *create* a new taste with very little effort.

Now, given our small, but highly-efficient motor, we know that good road performance is obtainable by putting it into a car of a weight in proportion to its power. Half a Cadillac motor will pull half a Cadillac car. Can we make that half car is the question troubling many engineers.

It is, of course, obvious that we cannot make it to hold the same number of people, the load must also be in proportion, but, if we continue the Cadillac allegory, and assume that this car gives a proper power for seven passengers, then the half size motor should be almost equally at home with four passengers and well content with three.

Most of the cheap five-passenger cars on the American market to-day are not big enough for their rated load. They are comfortable for four, but a tight fit for five, and it is noticeable on the road that the normal load is three or four. Past four there is just as strong a chance of finding six or seven aboard as of the rated five. So it is open to question whether the nominal five-seat capacity is so important as some people would have us believe.

In conclusion, the writer again wishes to emphasize the fact that he is unconvinced either way. He sets up no pretense to be a judge of the buyer's taste, but when so many engineers and so many manufacturers are found discussing somewhat along the lines here expressed, the questions become matters that the motorist and the member of the trade ought alike to consider. Perhaps nothing will happen, perhaps much will transpire; it is far too early yet to offer even an opinion on the subject. The purpose of the writer is to throw a little light on some straws which are fluttering in the breezes of Michigan and Ohio and have not yet taken a sufficiently settled position to indicate the way the wind is going to blow.

Argentina an American Automobile Market

AMERICAN-MADE automobiles are steadily gaining in popularity in the Argentine market, their proportion of the total imports of automobiles into that country having risen from 10½ per cent in 1912 to more than 19 per cent in 1913, the latest period for which detailed official returns are available.

The imports of automobiles into Argentina during 1913 were valued at $5,194,200, supplied chiefly by France, the United States, Germany, Italy, the United Kingdom, and Belgium, in the order named. While France still ranked first in the importation of automobiles into Argentina in 1913, the United States made a larger actual and relative gain than any of the other countries named, and rose from fourth place in 1912 to second place in 1913. In 1914, when the world-wide depression reduced the value of automobile imports into Argentina to about one-fifth of their normal total, those from the United States also decreased, the exports of automobiles from the United States to Argentina and other countries of South America in that year being a little over one-third of those of the preceding year.

Exports from United States

The imports of automobiles into Argentina during the last four years were as follows: 1911—2461, valued at $2,346,600; 1912—4281, valued at $5,159,000; 1913—5115, valued at $5,194,200; 1914; 2185, valued at $1,105,700.

Exports of automobiles from the United States to all countries increased from 329, valued at $2,833,154, in April, 1914, to 5345, valued at $8,045,222, in April, 1915. This growth was almost exclusively in commercial automobiles, of which the exports rose from 52, valued at $72,676, in April, 1914, to 2267, valued at $5,240,481, in April, 1915. About half of these commercial automobiles went to France and the remainder chiefly to England and other European countries. In the 10 months preceding May 1, 1915, exports of passenger automobiles aggregated 14,641, valued at $12,356,472, as against 23,167, valued at $20,664,480, in the corresponding period one year earlier; while those of commercial automobiles numbered 8580, with an aggregate valuation of $23,977,968, compared with 595, valued at $934,330 in 1913-14.

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Road Dust in Cylinders, Etc.

(*Continued from page* 18)

anism with a lot of exposed parts and journals and electrical connections and then actually suck all the dirt there is around the country in upon it."

Mr. Jehle cited German experiments to the effect that it was more important for cooling purposes to subdivide the air into small parts than to subdivide the water.

On the whole it was generally admitted at the meeting that the current of air which the fan of the average car is capable of drawing in through the average radiator is very wastefully applied, from which it would follow that the total area of air intake, at the front or rear of the radiator or behind the fan, could be reduced without harm if the means used for this purpose involved a more equable distribution of the air supply in all portions of the radiator and less violent counter-swirling of the air once it was under the hood. The problem of reconciling and combining such improved construction with provisions for filtering or precipitating the road dust before it reaches the carbureter is now bidding for an experimental solution which in course of due time may find its way into standard design.

For the first experiments it may perhaps be preferable to determine the dust question independently of all complication with the efficiency of the cooling system and to erect a filter box of ample dimensions around the whole carbureter, including hot, cold and auxiliary air intakes, but if the premises are found correct, according to which there are faults to be remedied at the primary air intake through the radiator as well as at the secondary intakes in the carbureter, the prettier and more thorough improvement must evidently in the long run be one which strikes the evil at its root, excluding dust from all air entering under the hood.

Among desirable data, meanwhile, would be such as would make it clear whether dusty country driving produces carbon deposit more rapidly than city driving, under otherwise equal conditions.—M. C. K.

Studebaker Refines Four and Six

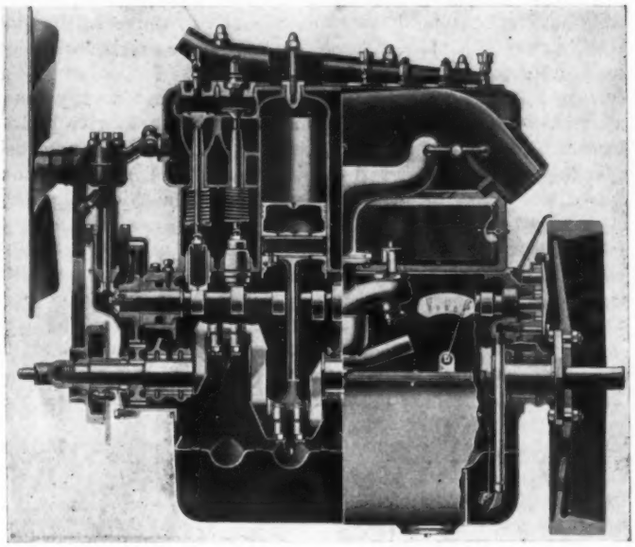
Cars for 1916 More Powerful, Larger, and Sold at Lower Price —Standardization of Parts Lessens Cost of Manufacture

GREATER standardization of the parts entering into its two chassis—four and a six—and further attention to production make it possible for the Studebaker Corp. to bring out its new models in larger and more powerful form at reduced prices.

The price cut is most emphasized in the six, which is to sell at $1,050 as a seven-passenger touring model, and $1,000 as a roadster. For the previous seven-passenger six, the price was $1,450. In the seven-passenger touring model on the four-cylinder chassis, the cut has been $100, making it $885; while the new roadster is $135 less than previously, or $850.

The bodies are practically alike on four and six chassis and most of the difference in wheelbase is taken up by the engine. The cars are made to conform to the same general design throughout, so far as possible. In fact, they are much more similar this year than ever before, and practically the only differences in addition to the difference in number of cylinders, are the wheelbase, rear axle gear ratio, and rear spring size.

This standardization is reflected in the prices.



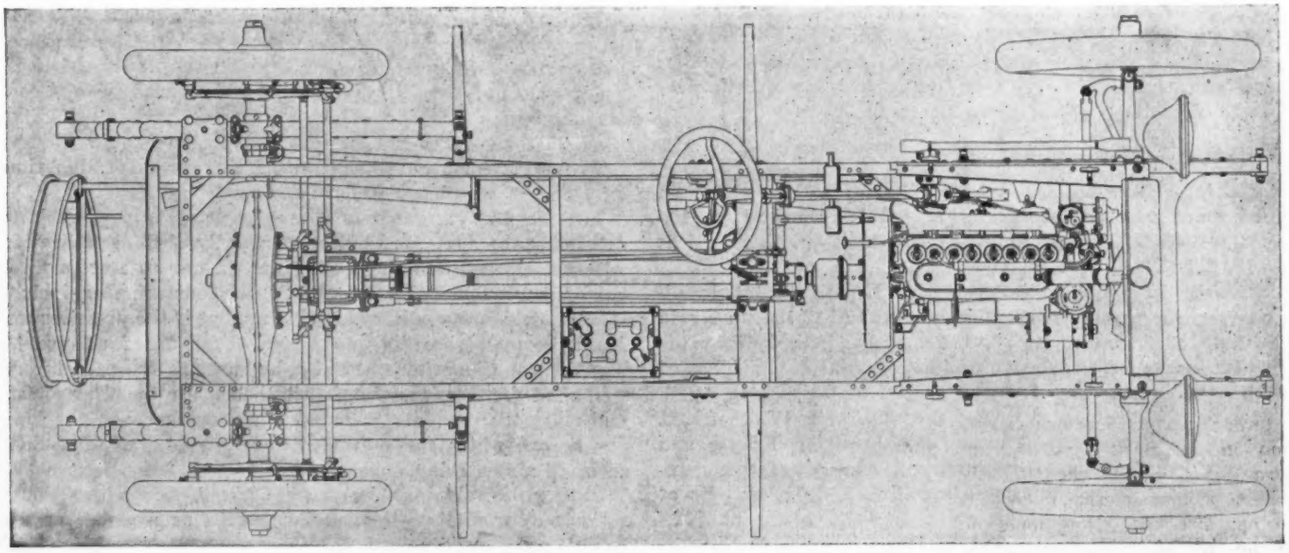
Studebaker four-cylinder motor similar design to six used for 1916

Greater Accessibility

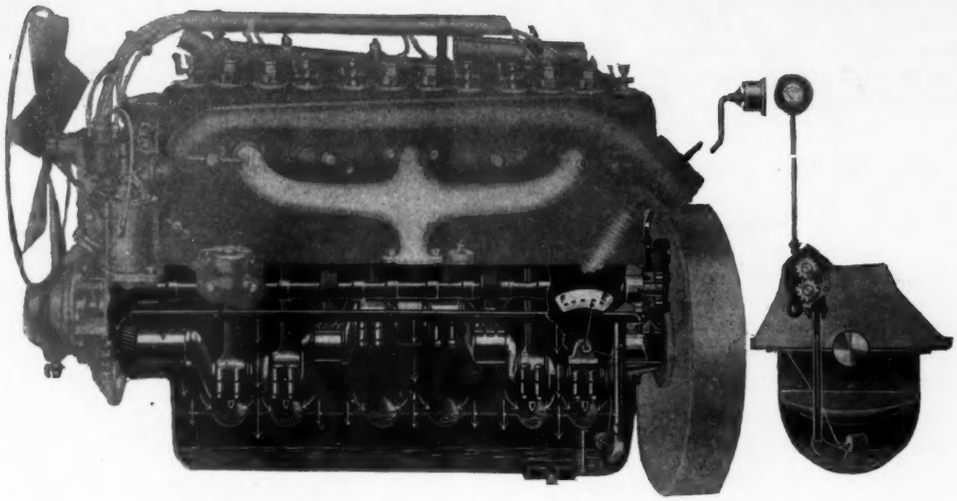
One of the main changes in the cars as compared with the previous types is in the redesigning of the engine for greater accessibility and quietness along with more power. The bore has been increased from 3½ in. to 3⅞ in., the stroke remaining the same as it was, at 5 in. The cross-shaft at the front has been removed, and there is a big change in the manifolding. The wheelbase has been lengthened on both chassis, the six getting 1 in. more, making it 122 in., and the four having 4 in. added to give it 112 in.

Improvement in the clutch, enlarging of the propeller shaft, a general smoothing out of the lines of the bodies, changes and simplifications in the electric system and the wiring, the use of real leather upholstery and some other minor improvements in the chassis and frame are points which will indicate that although Studebaker has seen fit to come down in the prices of its cars, there has been no curtailment of their value. In fact the cars are larger, more comfortable and have greater power.

In general, however, characteristic Studebaker design still holds in the mechanical make-up of the cars. The gearset is still in combination with the floating rear axle; a cone clutch is used; the Wagner electric lighting and cranking combination is employed, and the gasoline tank is in the cowl.



Studebaker chassis in plan view, showing the layout of the structural features of the chassis and drive members



Refined lubricating system as used in the six-cylinder model

The increase of the bore of the motor, together with the other alterations, add about 22.5 per cent to the piston displacement of the powerplants, and it is claimed that an even greater percentage of increase is made in the horsepower. The six has a displacement of 353.8 cu. in., and is rated by the maker at 60 hp., while the four has a 235.3 cu. in. capacity with rated horsepower of 40.

Cross-Shaft Removed

Probably the most important change in the engine design is in the removal of the cross-shaft at the front. This was spirally driven from the camshaft gear and operated the water pump on one end and the ignition distributer on the other. Now the pump is driven from the camshaft gear on the left, and the distributer is vertical and operated through bevel gear connection with the front end of the camshaft. The other unit affected by the change is the generator, which now sets on end with its armature shaft vertical and has spiral gear drive from the front gears. This is on the right forward side.

The starter motor is also placed at the front and on the right side. It is arranged horizontally and drives the crankshaft through a roller chain connection and a housed-in train of reduction gearing. The chain is not inclosed, and is compactly placed between the fan pulley and the gear housing. The driving sprocket has nine teeth, and the sprocket on the crankshaft end has forty teeth. In the front gear driving system of the new motors, the matter of silence is provided for by the making of the mainshaft and generator gears of case-hardened steel, with the camshaft gear of cast iron. This gives steel running against iron.

Manifolds Redesigned

Another big change is the abolition of the internally-cored passages for the distribution of the gases to the cylinders. The carbureter formerly occupied a position on the right side, and the gases thus went through the water jackets to the valves on the opposite side. Now, however, Studebaker has gone back to the original method of placing the carbureter on the valve side, and using separate manifolds to get the gases to the intake openings. It is believed that by using these manifolds with smooth and uniform passages, the power is augmented, for there is less friction. Cored passages are bound to be somewhat rough on the inside, and then, too, it is difficult to make the section uniform. With this new intake manifold construction, the exhaust header is shaped so that the intake piping can go below it without interference with the valve cover.

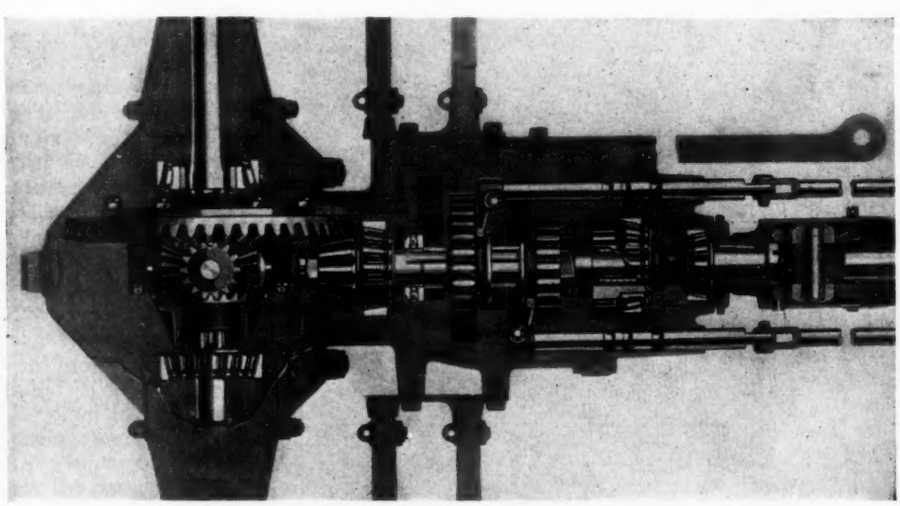
Along with stiffer rods and larger crankshafts, the pistons have been lengthened 5/8 in. to make them 4 5/8 in. long. The pins now are secured to the pistons by set screws, which is in contrast to the old method of pressing them into the rod end with bearing in the piston bosses.

A change has also been made in the tappet design, making it much easier to take them out if necessary. They used to be made of mushroom shape, that is, with the big end at the bottom, making it compulsory to take them out through the crankcase. Now they are the same diameter all the way down, so that they can come out through the top as soon as the valve and spring are out of the way.

Oiling System Altered

There is a change in the circulating splash oiling system, which is conducive to a more positive oiling at low engine speeds. The former plunger pump located on the side of the crankcase and driven by a camshaft eccentric has given way to a gear pump on the rear end of the camshaft. This also does away with the slight noise which the old type made. Also, the sight feed on the dash has been replaced by a pump pressure indicator.

A very clever improvement over the former wiring of the electric system is made in the fitting of a junction box. This box is placed on the right rear side of the engine where it is very accessible. All wires go to this box, and there is practically none on the body with the exception of that going to the control apparatus on the instrument board. A cover



Rear axle and transmission system which has been continued in the refined models

plate over this junction box held by four screws gives access to the wiring connection for the entire system. As this box is very close to the motor generator and starter, the wiring is consequently very short from them. All of the wires run through waterproof conduit, and as the system is of the one-wire type, it is doubtful if a more compact or simpler wiring layout could be worked out.

Should it be necessary to remove the body from the chassis, the minimum disturbance of the wiring would be necessary, due to this mounting on chassis and motor. Further, it is usually considered that the greatest troubles from the electric systems of the modern car are due to the working loose of connections, and as most of them on these new Studebakers are a part of the rigid portion of the machines, any body movements will not affect them—factors which should make a very efficient electrical system on the whole.

Six-Volt Electric System

The storage battery, a 100-amp.-hr. Willard, is placed under the right front seat and attached to the frame in a special hanger. The electric system operates at 6 volts, and though the starting unit is smaller and of lighter weight, it is said to be more efficient, cranking the engine at higher speed through being geared higher.

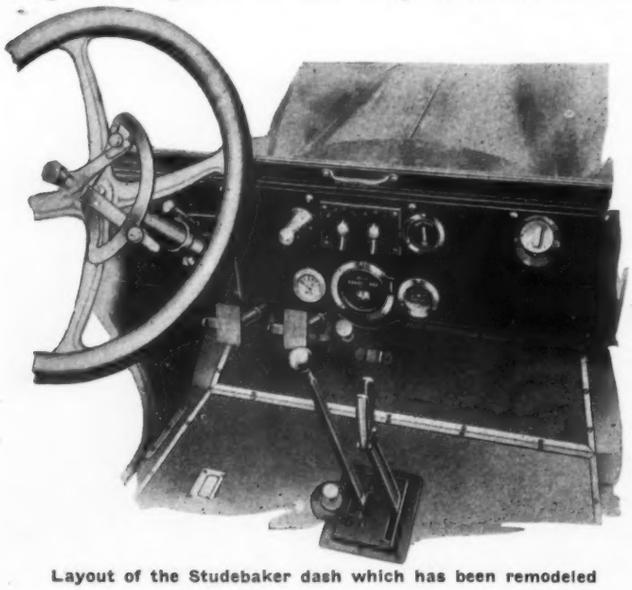
In the clutch a change has been made to make this unit more serviceable. The former bronze clutch collar has been replaced by a ball-bearing throwout, this tending to less wear and requiring less attention.

The propeller shaft has been made more substantial and whipping has been prevented by increasing the diameter from 1⅛ in. to 1 5/16 in. The shaft is an alloy steel design, fitted with a universal at either end.

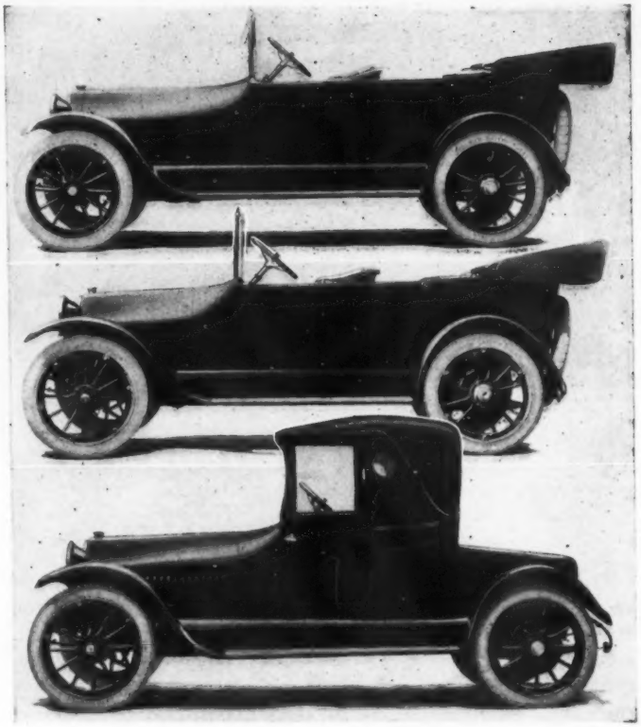
The gearset bolts through a flange to the pressed-steel housing of the rear axle, and on the left side of it is attached a pressed-steel torsion arm which runs forward to a mounting on the intermediate frame cross-member. Radius rods run forward to the frame side members to do their part in preserving axle alignment.

Brake operating shafts and equalizers are now carried on the rear axle unit, and the brakes and radius rods now swing on the same center making for uniform brake action regardless of car load. In the gearset there are no changes, but the axle housing has been made heavier. The four-cylinder chassis has an axle ratio of 4 to 1, and that of the six is 3.7 to 1.

The entire spring suspension has been gone over, and on all cars three-quarter elliptic rear springs are fitted, these being underslung from the axle. They measure 51 in. rear and 38 in. front on both cars. The previous four has elliptic rear springs, although the six used three-quarter elliptics. The cars are lower hung than formerly also, this being brought about by the lowering of the rear springs along with the dropping of the front axle at the spring seats.



Layout of the Studebaker dash which has been remodeled



Studebaker bodies for the 1916 season, showing from top six-cylinder seven-passenger, five-passenger design and coupé

Frames have been strengthened by having fewer holes in them, and these are not in line, so that no weakening should result. Another minor chassis detail is the fitting of a long tail pipe to the muffler to avoid noise under the body.

Tires are 34 by 4 on either chassis, this being an increase on the four which formerly was shod with 33 by 4's. Straight sides are used, the rear set being of the safety tread type. A new form of rim is also supplied, the main feature of which is a special form of pawl lock which makes it easier to detach the tire.

The wheelbase increases give more body room, and along with this, the bodies are well proportioned and of excellent lines. The back of the front seat has been shaped to fit the back, really making an individual back for each of the front passengers. A new form of auxiliary seat is provided. These fold into compartments in the floor of the tonneau, and when not in use, they are flush with the floor. But when unfolded, they leave a sub-floor exposed, and in this the seat occupant can comfortably put his feet.

These comfort features taken together with the fact that more attention has been given to balance than ever before, so that vibration and motor noises have been materially reduced, gives a more efficient power-plant as well as a more efficient chassis. Heavier dimensions in critical parts from crankshaft throughout the entire chassis are in a measure responsible for the excellent results.

In the control of the cars, the improvements are principally the providing of adjustable pedals, and the locating of the starter pedal more conveniently at the gearshift gate. A new dash arrangement has also been effected with the instruments all grouped for one light. The rotary electric switch has been removed from the heel board and mounted on the dash, and a lock is provided for the ignition switch. A vibrator type of horn has given way to a Sparton.

The Automobile

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Aluminum Pistons

ONE of the significant points of the S. A. E. summer session was the fact developed that aluminum pistons are here to stay. They have come as only another interpretation of the practically universal trend towards small bore and high speed.

Granted then, that this field has been opened to the aluminum foundrymen and the aluminum piston has been accepted, there are still some points which have not been reduced to standard practice. The formula for the alloy itself is still in the trade-secret class and naturally the subject of a difference of opinion. The exact clearances necessary are still debated and the reinforcing of the piston head to take care of the effect of the high temperatures on the strength of the material is a necessary precaution which must not be underestimated.

These and the other technical questions must be studied by the foundrymen because there is no doubt in the light of present developments that the car designer is going to call upon them to furnish these light castings. In the discussion at the S. A. E. meeting on the Lakes no one brought any serious objection against the light pistons, and now that the engineers of the automobile industry have given their approval it is to be expected that cars regularly equipped with these pistons will rapidly increase. In meeting the demands for light weight in pistons aluminum alloys are today occupying the position that cast steel was booked to take.

100 Miles Per Hour

FIVE HUNDRED miles in 5 hr., almost if not quite, for 7½ min., less would have done it! Pause and think, for it is truly something worth thinking about.

What does it *mean?*

This perfectly prodigious speed means that firstly, the machine has been created of the needed power and stamina; secondly, that the air-filled tires have been made to carry the machine and transmit the power; and thirdly, that the track has been built on which such a machine can run in safety.

For the track, all credit to those who constructed it, but no deep problems of science had first to be mastered.

For the tires, the mechanical clear thinking which produced the cord construction and the labor of rubber experts calls for praise and admiration.

For the machine, we have to make acclamation to thousands of engineers and thousands of metallurgists of many nations, who together have devised new and ever new ways for loading metal as it never was loaded before, and for making new metal to bear the stress.

Like all marvels of this age, we, a people dulled to appreciation by ever-repeated wonders of mechanics, are apt to regard it very calmly.

What, after all, is there so very wonderful about it?

Well, let us pour out a bucket-full of gasoline and placing it on the floor take in our hands four aluminum pistons weighing, say, a pound apiece. Problem: From some stuff like that limpid liquid in the bucket, through the medium of these four bits of bright metal, push 2 tons on wheels 500 miles in 5 hr.

What would you have said 10 years ago?

Don't Stampede

A NOTED English engineer recently voiced the opinion that the multi-cylinder movement which has gained such headway in this country will serve to develop the four and the six. In Europe the same conditions were experienced, only instead of eights and twelves, the six was the disturber. For several years Europe took up sixes enthusiastically, but now there are few made abroad. The six was more flexible and a better performer than the fours then built, but its coming stirred the designers of fours to greater activity, with the result that before long they were producing fours that were as good performers as the sixes. It took the six to waken them.

The public is not going to care whether it rides behind a four or an eight or a twenty-four so long as one performs as well as the other, so is not the main thing to bring the fours and sixes up to the standard of the eights and twelves? It will be easier for many engineers—and better perhaps for the dividends of the concerns they represent—to concentrate upon the making of better engines of types with which they are already familiar, than to strike out blindly into a field of design that is wholly new.

Two-Speed Rear Axle Suit

Washington Patent Attorney Sues Cadillac Dealer and Detroit Maker

WASHINGTON, D. C., June 26—Claiming damages in the sum of $100,000 Dempster M. Smith has filed suit in the District supreme court against the Cadillac Motor Car Co., Detroit, Mich., and the Cook & Stoddard Co., their agents here. Smith claims that he is the inventor of certain improvements for a motor car to change the speed gearing; that letters patent were issued to him by the patent office on February 7, 1911, and January 27, 1914, for these inventions. He further alleges that the Cadillac Co. and the Cook & Stoddard Co. have sold cars equipped with double direct-drive transmission gearing, which, he claims, is an infringement on his invention and that said gearing is in all respects similar to the gearing covered by the letters patent which he holds. He alleges that these cars have been exposed for sale since the issuance of the patents to him. Smith is a patent attorney and is associated with a patent law firm here.

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Two Hudson Additions

DETROIT, MICH., June 28—The Hudson Motor Car Co. has contracted for two additions to its plant which will cost about $40,000. The first addition, a two-story building, 60 by 180 ft., will provide more room for the tooling and enameling departments. The second addition will consist of a three-story building, 60 by 100 ft., to the chassis and chassis painting departments.

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Monarch Officials Resign

DETROIT, MICH., June 28—Three officials of the Monarch Motor Car Co., H. D. W. Mackaye, sales manager; W. R. Bamford, production manager, and A. A. Lehr, director of purchases, have severed their connection with the company and will enter into business for themselves.

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Tire Co. to Start Near Denver

DENVER, COL., June 24—Colorado will soon have a modern tire factory, which will make tubes and casings especially adapted for the dry climate of the Rocky Mountain region. The plant is now being constructed and equipped at Arvada, 7 miles from Denver, by the Dry Climate Tire Mfg. Co., a Colorado corporation.

The first unit of the factory, a one-story building 75 by 200 feet, has been completed, and the machinery will be installed at once. The new concern expects to have tires ready for the market by July 1. The plant will be of modern construction throughout, equipped with the latest machinery, and expert tire builders will be brought in to take charge of the work.

Among the experienced tire men connected with the new enterprise is F. B. Clark, for several years with the B. F. Goodrich Co., who will be sales manager for the Dry Climate tire and who is well known to the trade throughout the ten or twelve states comprising the territory for which the new tires will be especially made. In the beginning, at least, the company expects to confine its trade to Colorado, Wyoming, Idaho, Utah, Arizona, New Mexico and part of Oklahoma, Texas, Kansas, Nebraska and South Dakota. This territory is now showing a yearly increase of about 10 per cent in the tire business.

The promoters of the new project have been experimenting for a year and a half to ascertain results of curing and vulcanizing tires in this climate, and claim that they will be able to sell their "acclimated" tires at standard prices and also furnish a 10 per cent. better guarantee.

The factory is being erected on a two-acre site donated by the people of Arvada, and the company has an option on an adjacent tract of five acres for expanding. The concern is incorporated for $200,000 and is financed entirely by Colorado capital.

There is no other tire factory in this vast territory between the Mississippi Valley and California.

The present size of the plant will have a capacity of 100 tubes and cases daily.

—

Fight Tar Nuisance

BOSTON, MASS., June 19—The first gun in the campaign to abolish the tar nuisance where the entire width of the highway is spread with it at one time took definite form here last week when the Automobile Legal Association sent out a request to newspapers and other organizations to fight the matter. The Bay State A. A. officials at once pledged their aid and the fight will be made throughout the State. The Highway Commission is to be asked to specify in all its contracts that but one side of the road shall be tarred at a time. In its request issued to-day the Automobile Legal Association states that the tarring of the entire width of the highway is not only responsible for damaging cars, but it also makes traveling dangerous, and increases the chances of accidents. And as the motorists pay more than $1,000,000 now in fees alone, exclusive of personal property taxes, it is felt that such nuisances should be abolished.

U. S. L. & Heat Co. Reorganized

Capital, $7,000,000—Headquarters at Niagara Falls—To Sell Old Co. July 1

ALBANY, N. Y., June 28—The United States Light & Heat Corporation of Niagara Falls, was incorporated to-day with a capital of $7,000,000. The company purposes to manufacture machinery and apparatus for the production of light, heat and power. The directors include A. Stanley Jones of 61 Broadway, New York; G. M. Walker and A. L. Fowle, 60 Broadway, New York.

The new company is to take over all the property and assets of the old United States Light & Heating Co., valued at approximately $2,500,000. The stockholders of the old company already have paid in assessments amounting to $472,000 and it is expected that before the new company begins business on July 1 at least $525,000 will have been received.

The sale of the property of the United States Light & Heating Co. is to take place at Niagara Falls on July 1 next and the stockholders' protective committee will bid for the property on that date, an amount probably slightly in excess of the $750,000 of debts of the old company.

It is the purpose of the management of the new company to eliminate the New York office, having its headquarters in Niagara Falls.

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Chalmers Twin City Change

MINNEAPOLIS, MINN., June 29—The Chalmers Northwest Co. has been organized and incorporated, its capital stock being $50,000, of which $35,000 has been paid in. The new company has been appointed distributor for the Chalmers for practically the entire state of Minnesota and sixteen counties in Wisconsin. E. C. Thompson is president of the company; G. N. Michaud, vice-president; R. V. Hess, secretary-treasurer. Joseph Warren, formerly with the Chalmers Motor Co., Detroit, is sales manager for Minneapolis and G. N. Michaud is sales manager for the branch which will be operated in St. Paul.

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Keeton Plant Sold

DETROIT, MICH., June 28—The Detroit Trust Co., receiver for the American Voiturette Co., which made the Car-Nation and Keeton cars, has sold the bankrupt concern's plant to Louis R. Grosslight, Detroit, and Isaac Gersen, Toledo, Ohio. The plant and factory property were appraised at $45,000 and it is said that this amount will be realized by the sale.

1916 Crow Price Reduced

Four-Cylinder Model Offered at $725 or $425 Lower—Complete Equipment

NEW YORK CITY, June 24—The Crow Motor Car Co., Elkhart, Ind., is offering a popular priced model for 1916 listing at $725 with full electrical equipment. This is a reduction of $425.

This new model known as the CE "30" is the largest four-cylinder Crow model that will be produced this year. The 3½ by 5 long stroke motor develops 34.9 hp., on brake test. The cylinders are cast en bloc with water jackets integral. The cylinders and head are cast separately. The head is removable. The connecting rods and crankshaft are drop-forged, 40 per cent carbon steel, double heat treated. The exhaust manifold is cast with an inner partition to prevent back pressure from one cylinder to another. The front crankshaft bearing is 1¾ in. diameter by 3¼ in. long and the rear is 1¾ in. by 3 15/16 in. long.

The axles are of the same design as previously used in Crow cars. The rear axle is full-floating with differential gears of nickel steel and is accessible for adjustments. The front axle is an I-beam section, drop-forged in one heating with no welding. The brakes have 11-in. drums and a 100 per cent braking surface. The front springs are full elliptic; rear springs are three-quarter elliptic and are slung under the axle with supports which swivel on the crucible steel axle housing.

Thermo-syphon cooling system is used. Lubrication is by means of the splash, constant level system; the level being maintained by a plunger pump. The crankcase is reinforced aluminum. It is possible to remove any connecting rods and pistons without disturbing the adjustment of the main bearings.

The equipment is complete including head-light dimmers, dash light, muffler cut-out, combination tail-light and license bracket, hinged robe-rail, tire and rim carrier in rear and extra rim.

The body is of streamline design. The built-in windshield is of the rain vision, full ventilating type. The steering column is placed at the left with gear shifting lever and emergency brake in center. The Disco starting, lighting and generating system is of the single-unit type with a 12-volt battery under the front seat. Stewart speedometer, dash light, electric switch and gasoline tank filler are located on the instrument board.

The wheels are 32 inches, equipped with 3½-in. tires and demountable rims.

Auburn Four and Six for 1916

NEW YORK CITY, June 25—The Auburn Automobile Co., Auburn, Ind., has announced a four and a six for 1916. The four will sell for $985 and the six for $1,550.

The four is a T-head motor, cast en bloc, 3⅞ by 5, unit power plant with three point suspension. Other features are cantilever springs, left drive and center control, electric lights and electric starter, one-man top, and fully equipped without extra cost. The wheelbase is 114 in. and the tread is standard.

The six seven-passenger touring car has a 3½ by 5 motor, center control, left drive, cantilever springs, electric lights and starter, one-man top and folding and disappearing extra seats. The wheelbase is 126 in.

1916 Moon Six at $1,475

NEW YORK CITY, June 26—The Moon Motor Car Co., St. Louis, Mo., has announced a seven-passenger six for 1916 selling at $1,475.

A 40 hp. 3½ by 5 Continental-Moon motor, with Delco starting, lighting and ignition system with a new switch, having an ammeter on the dash, is used. Other features are a Hotchkiss drive with underslung rear springs; a longer wheelbase, 125 in.; streamline body with disappearing seats entirely concealed when not in use; Stewart vacuum gasoline feed and speedometer; full-floating rear axle, crown fenders and one-man top.

A larger six, 50 hp., selling at $2250, will also be manufactured. This car embodies the same mechanical design as the 1915 model. The company will manufacture only these two sixes for 1916.

Ford Postpones Capital Increase

DETROIT, MICH., June 28—Rather than incorporate in another State than Michigan, the Ford Motor Co., it was said yesterday, will delay for two years the payment of its stock dividend and increase its capital from $2,000,000 to $50,000,000.

The directors recently decided to make the increase in capital stock and to pay a stock dividend of $48,000,000. It was discovered, however, that Michigan laws provide that no company incorporated under its statute shall have a capitalization in excess of $25,000,000. The company has therefore decided to wait until legislative action empowers it to carry out its proposed plan.

Overland Raises Wages

TOLEDO, OHIO., June 25—The Willys-Overland Co. has raised the wages of its 10,500 employees 5 per cent, effective July 15. The increase was voluntary, and will add $520,000 a year to the payroll.

Apperson Eight at $1,850

Two Sixes Also to Be Made by Kokomo Concern—Four Dropped

KOKOMA, IND., June 28—Apperson Bros. Automobile Co. of this city, has announced an eight-cylinder car for the 1916 season. It will be known as the eight-sixteen and will be made in a seven-passenger touring car and a four-passenger roadster. The wheelbase is 128 in. and the eight-cylinder motor is a V-type having 3⅛-in. bore and 5-in. stroke. The cylinders are cast in blocks of four and mounted on an angle of 90 deg. on the crankcase.

In addition to the eight, there will be two sixes. A large car known as the six-sixty, of 135-in. wheelbase and a T-head 4¼ by 5 block motor on which is carried a seven-passenger touring body and a smaller six known as the six-sixteen, which will have a five-passenger car mounted on 122-in. wheelbase and a seven-passenger touring and four-passenger roadster on 128-in. wheelbase. The motor in this car is an L-head 3½ by 5⅛ with the cylinders cast in a block.

Large Size, $2,350

The prices for the eight-cylinder cars are $1,850 for the larger six; $2,350 for the smaller six; $1,485 for the five-passenger car; $1,550 for the roadster and seven-passenger design. The four-cylinder model made for 1915 has been discontinued.

Chief interest centers around the eight-cylinder car as it marks the entrance of one of the older concerns in America in this new field. The car is fitted with a three-speed gearset, floating axle and full electric lighting and starting equipment. It is of distinctive appearance having a V-shaped radiator which is used in connection with a thermo-syphon system. The tires are 34 by 4 in. on demountable rims and gasoline is fed by means of a vacuum system.

Compression Band Clutch

The six-sixty also uses a three-speed gearset with floating axle and is fitted with the Apperson compression band clutch. Cooling on this car is by vein pump and the V-shaped radiator is also employed. The tires on this car are 37 by 4½. The oversize for the 36 by 4 wheel. On the smaller six, known as the six-sixteen, pump water circulation is also used, together with three-speed gearset and floating rear axle. The tires are 34 by 4 on demountable rims and the gasoline is fed by vacuum system. All the cars are fully equipped, the fittings being included in the purchase price.

Briggs-Detroiter Bankrupt

Liabilities $350,000, Assets $150,000—Detroit Trust Co. Appointed Receiver

DETROIT, MICH., June 28—Referee in bankruptcy Lee E. Joslyn, to-day adjudicated the Briggs-Detroiter Co., manufacturer of the Detroiter cars, bankrupt, Saturday, June 26, Judge Tuttle of the United States district court, appointed the Detroit Trust Co. receiver for the automobile manufacturing company. Since June 16 the trust company has acted as custodian for the automobile concern.

An inventory of the liabilities and assets of the concern is now being prepared by tht Detroit Trust Co. and will not be completed for several days, but it is estimated by officials of this company that the liabilities will total between $350,000 and $400,000 and the assets $150,000 or thereabouts.

The creditors' committee which has been trying to re-adjust the affairs of the company was composed of R. K. Davis, Penn Spring Works, chairman; Louis S. Smith, Griswold Motor & Body Co.; M. A. Monahan, Gemmer Mfg. Co.; M. Brooks, Kelsey Wheel Co., and Attorney Luman W. Goodenough. The Briggs-Detroiter Co. was organized in November, 1911, with a capital stock of $200,000.

Westinghouse Rebuilding Cleveland Plant

EAST PITTSBURGH, PA., June 24—The Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa., has obtained a permit to make extensive alterations in its Cleveland plant. It is stated that all wooden buildings will be replaced with modern fireproof structures. On completion of the new foundry the company plans the removal of the Pittsburgh foundry equipment to Cleveland.

Syndicate Buys 40,000 Shares of Stewart-Warner Common

NEW YORK CITY, June 28—A syndicate headed by White, Weld & Co. and Hornblower & Weeks, in which John Burnham & Co., Kissel, Kinnicutt & Co., and others are interested, has purchased from President J. K. Stewart of the Stewart-Warner Speedometer Corporation, 40,000 shares of his holdings of common stock in that concern. Mr. Stewart was the owner of considerably more than half of the $10,000,000 common stock and still remains the largest individual shareholder. He will continue as president, his contract to fill that office running until July 1, 1916.

The syndicate intends to resell the stock privately to investors and the syndicate agreement runs until Sept. 1.

To date the company has made about 150,000 horns and 80,000 vacuum tank gasoline feed systems. Net earnings of the company for the first quarter of 1915 increased approximately $185,000 over the corresponding period of 1914, and gross sales for the second quarter are estimated to be 25 per cent ahead of a year ago.

Picard to Distribute Connecticut-Ford Ignition System

NEW YORK, June 30—A. J. Picard & Co. has been appointed exclusive distributor by the Connecticut Telephone & Electric Co., Meriden, Conn., for a new ignition system for Ford cars which the latter company is just placing on the market. This is the standard Connecticut automatic ignition system with the necessary brackets and wiring adapting it for a Ford car. The system is designed for use on any Ford car which is equipped with a storage battery for lighting purposes. A feature is that only the switch appears on the dash, the coil being mounted on the engine close to the distributer.

Postal Service to Order 100 Trucks

WASHINGTON, D. C., June 29—*Special Telegram*—Within the next few days, the purchasing agent of the postal service will issue a call for bids for furnishing approximately 100 trucks for the city and rural delivery service.

The conditions to be presented in the proposals will be such as to make it possible for every manufacturer of trucks to enter the competition. The date of the opening of the bids in this city will be announced by the postoffice department later.

Continental After Boat Factory

MUSKEGON, MICH., June 26—The Continental Motor Manufacturing Co. is trying to secure for a period of about six months half of the shops of the Racine-Truscott Shell Lake Boat Co. and has taken up the matter with the receivers for that concern. Although more than 1600 men are now employed by the Continental company and large additions are in course of construction, more room is needed at once. If the shops are secured it will mean that the working force will be increased by 250 to 350 men at once.

$175,000 Addition for Packard

DETROIT, MICH., June 22—The Packard Motor Car Co. will erect a five-story factory addition, 395 by 60 ft., of reinforced concrete. It will cost $175,000.

Australia Requires Motor Trucks

Right-Side Drive Vehicles Are Desired—Dealers Want Sound Financial Makers

SYDNEY, AUSTRALIA, June 4—Motor truck business is going to be enormous in Australia, in fact, it would not be surprising if inside of a year the country would be taken by storm in the demand for trucks. Horse feed is to-day at a premium and of an inferior quality at that. Horses are getting scarce, due to the increased demands of the war. Everything points to a shortage of both vehicles and men and in the transportation of goods the solution seems to lie in the path of the motor truck.

Conditions in this country at the present time are prosperous, extraordinarily so, but it is difficult to see from what source such prosperity is going to continue. This country is one of enormous wealth and it is marvelous where money comes from, so it will not be surprising to see the trade hold up in spite of the war.

The jitney bus is arriving. Some operators are using ¾-ton trucks which have been fitted with special bus bodies. The jitney is going to command great attention as this country has great opportunities for motor passenger service.

In this country the motorists are glad to see that America is taking up the movement THE AUTOMOBILE advocated for years, namely, smaller high-speed engines as exploited in Europe. Over here, the big, low-speed American motor has been objectionable to buyers and it is only the price of American cars that has kept them in the lead. With the advent of the high-speed, smooth-running motor you can rest assured that American cars are going to come into public favor more than ever before. At the present time it looks as if eight- and twelve-cylinder cars will not be popular.

At present some of the leading dealers in Sydney and Melbourne are in the market for a good line of trucks ranging in capacity from ¾ to 4 or 5 tons. These dealers are particularly interested to get agencies from companies that are well backed financially and not likely to go out of business in a few years. It is necessary to have right-hand drive vehicles here, the left-hand drive is prohibited in some of the states of Australia and it is possible that this prohibition will extend throughout the entire Continent.

Rands Top to Add

DETROIT, MICH., June 24—The Rands Mfg. Co., top and specialty makers, will build a three-story factory addition to cost $20,000.

Dealers' Activity in Middle West

Many Changes in Dealers in Kansas Territory—Limit Dealers' Tag Use

KANSAS CITY, MO., June 30—There has been considerable change in many dealers throughout the Kansas territory during the present month. A. L. Ellwood has succeeded Capt. W. F. Siegmund as manager of the Kansas City branch of the Marmon company. This branch will have henceforth larger scope, and will be the distributing center for Kansas, western Missouri, Oklahoma, Nebraska, northern Texas and southern Iowa. Mr. Ellwood comes from St. Louis, where he was Western salesmanager of the Locomobile. Captain Siegmund resigned to become vice-president and general manager of the Automobile Sales & Service Co., in St. Joseph, Mo., which will handle Marmon, Maxwell, Hudson, Detroit Electric and the G. M. C. The Fifth St. Garage & Repair Co., 210-14 East Fifth Street, is extending its quarters and will have capacity for sixty cars in the garage department.

E. W. Arrasmith, formerly in charge of the retail department of the Oakland Motor Co., of Kansas City, has organized the Kansas City Oakland Automobile Co., which will have the retail business of the Oakland here. The Oakland Motor Co. will do only a wholesale business. The headquarters will continue as heretofore at 1521-23 McGee Street.

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Kansas Dealers' Tags Restricted

TOPEKA, KAN., June 24—J. T. Botkin, Secretary of State, in sending out blank applications for motor license tags, has issued a general warning that in Kansas dealers' tags can be used only on demonstration machines, and their lending to customers of the dealers is a violation of law, and will be prosecuted.

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Packard Missouri Co. Expands

ST. LOUIS, MO., June 26—It became known here recently that $175,000 was the price paid by the Packard Missouri Motor Co. to the Halsey Automobile Co., for the latter's four-story building here. W. J. Parrish, who recently bought out O. L. Halsey's interest in the company bearing his name, has moved from Kansas City to St. Louis and from the newly acquired building here, will direct the distribution of the Packard company's cars into Missouri, Kansas and Oklahoma.

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Goodrich Expands Service in Joplin

JOPLIN, MO., June 25—The B. F. Goodrich Rubber Co. has established its third mechanical depot branch here, putting this city in the class for distribution purposes, with Birmingham, Ala., and Norfolk, Va. N. B. Finney, formerly of Denver, Col., will have charge of the sales. John W. Pratt was transferred from Buffalo, N. Y., to take command of the local branch. The Middle West and Southern States will be supplied from this branch.

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Dodge Bros. Contest Income Tax

WASHINGTON, D. C., June 26—Counsel for John F. and Horace E. Dodge, of Dodge Bros., Detroit, Mich., yesterday filed a brief for argument before the United States Supreme Court, attacking the surtax on incomes of individuals under the Federal Income Tax law. This is the first attack to be made on the constitutionality of this law.

The case was begun to prevent the collector of internal revenue at Detroit from collecting a surtax on each of the Dodges of approximately $45,000 for the year 1913. The Federal district court in Michigan held the tax valid.

Three main reasons were assigned for claiming the surtax provision of the law is invalid. Stockholders in corporations, it is asserted, when computing their surtaxes, are subjected to liability for the gains and profits of the corporations which have not been divided or distributed. "To tax a stockholder on prospective dividends which he may never receive can only be properly characterized as so utterly absurd as to induce levity," the brief declares.

It is charged also that the provision vests in the Secretary of the Treasury an arbitrary power of determining, without a hearing, whether any corporation has accumulated a greater undivided surplus than is reasonable for the needs of the business. "How can he reach such a decision?" it is asked. "The law makes no provision to aid him."

A third reason is that the provision permits corporations to accumulate and withhold from surtax such part of their profits as may be reasonably necessary for the needs and purposes of their business, and does not accord such business privilege to individuals and partnerships. It is urged that corporations are thus favored by a "most invidious discrimination."

The brief urges that the sixteenth amendment to the constitution did not obliterate entirely the provisions of the constitution against "direct taxes," and that Congress can only tax income and not real or personal property. It is contended that Congress can make no distinctions as to the source of income.

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New Studebaker Truck Manager

ST. LOUIS, MO., June 26—J. L. Bergs, formerly Illinois territory representative of the Studebaker company, has been placed in charge of the commercial car sales of the St. Louis branch of the Studebaker corporation.

Sioux City, Omaha and Tacoma Ready

Entries Full at Three Speedways—Omaha Ready for Inaugural Opening

CHICAGO, June 29—*Special Telegram*—The majority of the racing cars and drivers who participated in the 500-mile race on the new speedway here last Saturday have shipped their cars for Sioux City and Tacoma, where races will be held during the national holiday. The Sioux City 300-mile race which was started last year will be held on Saturday, July 3, on the 2-mile dirt speedway in that city. On the following Monday the opening of the 1.25-mile board speedway at Omaha, Neb., will take place with a 300-mile race. At Tacoma, Wash., three races will be held on Sunday and Monday, July 4 and 5, on the new 2-mile board speedway, which was opened last year as a dirt track and has since been boarded. Prizes amounting to $15,000 will be given at both Sioux City and Omaha.

Three of the drivers that competed at Chicago will pilot cars at Tacoma. They are Earl Cooper, Bob Burman and Billy Carlson. All three left for the Northwest Sunday morning.

Dario Resta, winner of the Chicago race, will be the headliner at both Sioux City and Omaha, while Burman, Cooper and Carlson will have to divide the glare of the spotlight with Barney Oldfield at Tacoma.

Sioux City Entries

The following twenty-two entries have been recived for the Sioux City race:

Peugeot, Resta; Maxwell, Rickenbacher; Maxwell, Orr; Duesenberg, Alley; Duesenberg, O'Donnell; Duesenberg, Haupt; Erwin Special, Grover Bergdoll; Erwin Special, driver unnamed; Duchesneau, Brown; Mais Special, Mais; Sebring, Joe Cooper; Emden, Grant Donaldson; Mulford Special, Ralph Mulford; Ogren, Chandler; National, Butler; Chalmers, Wetmore; White, Shrunk; O'Connell Special, driver unnamed; Anderson Special, Scott; Berwyn Baby, Zucher; and Donaldson Special, Lou Donaldson.

The prediction is common that Rickenbacher's average of last year 78.6 miles an hour will be shattered. The track, hard packed and oiled, is much faster than in 1914, and cars have shown greater velocity this season than they did last.

Porter-Knight Withdraws

The three Knight-motored Porter Knight cars entered at Omaha were withdrawn by Finley R. Porter.

Analysis of Automobile Industry in Great Britain During War

Factories Busy on Aeroplane Motors— Private Car Output One-Third Normal— Used-Car Values Advanced 7 Per Cent

LONDON, June 17—It is not easy to write on the present position of affairs in the automobile world here, partly because the picture is as everchanging as the chameleon, and partly because, since the government order which has led to the taking over of some of the most important factories, those works have been completely shut, barred and sealed to all outside enquiries. This order came into force March 15, chiefly as the result of labor troubles. Strikes and this order have introduced the public to the word output, which, formerly the keynote of the manufacturing engineer, has now become the shibboleth of the man in the street. Two main factors have affected the motor output of this country: 1. shortage of labor; and 2, strikes.

In comparing British automobile output before and during the war one can only generalize, for there are all sorts of conditions to throw out any accurate computation. Many factories, as, for instance, the old Argyll works, which have been bought by Armstrongs, are turned on to ammunition making. Others, like Wolseley, Daimler, Sunbeam and Austins are making aeroplane engines, some of them of the eight-cylinder V-pattern, others of the Gnome rotating-cylinder type, others with twelve cylinders 90 x 150 mm. arranged V-pattern, these last being intended for sea planes.

Again, private car manufacture is being ousted by the call for trucks. Some firms, like the Star, that did comparatively little in this line have been turning out a lot, some I believe for Russia (Austins have also done a vast amount for the Russian Government), while others like the Daimler or the Wolseley, that made commercials in considerable numbers, are turning them out in far greater numbers. And the demand does not stop with the truck: for instance, one big midland firm is making big sleeve-valve engines for gun tractors. Then again another firm is engaged in armoring and fitting up a lot of Pierce-Arrow commercial chassis for use with armored cars and to carry a gun. Again, to give another example of how difficult it is to obtain a basis for estimating the output of the present, let me mention the case of a commercial truck making firm with an output of twelve or fourteen trucks a week in normal peace time: at present they are not turning out a single car, but are devoting themselves to the making of spare parts.

This demand for spare parts assumes considerable dimensions. For instance, for every twenty chassis the British War Office requires one extra steering gear and housing; for every ten chassis one water pump, one set of holding-down dogs for tappet guides, one gasoline tank, and one set of selector mechanism have to be supplied; for every five chassis one complete set of connecting rods with bolts, one set of radiator tubes, one set of gearbox ball bearings and thrust washers. Every three chassis have a complete spare radiator; every two chassis a set of big end and crankshaft bearings. Each single chassis has its spare set of pistons with wrist pins and rings, and two sets of liners for shoes for the foot brake.

Output, 35,000

The normal British output of makers of private cars, light vans on pneumatic tires, in fact, all vehicles having the characteristics of private car chassis, may be put at not more than 30,000 to 35,000. It is impossible to give a closer estimate as no figures are available. Whether commandeered lock, stock, and barrel, or left alone, the total output of private cars from British factories at the present time scarcely exceeds one-third the normal for this time of the year, the rest of the industry's energy being devoted to war material, either as contractors or sub-contractors. On the known weekly output of all the leading commercial automobile works in Great Britain the normal annual output of heavier vehicles may be placed at 10,000 to 12,000, and careful enquiries point quite decidedly to the fact that some 40 per cent. more stuff is now being turned out than before the war.

The output of the big private car-making works, like those of the Daimler, Sunbeam, Lanchester, and Rolls-Royce, have been practically taken over by the government, while even considerable firms that are not requisitioned, such as the Rover and Swift or Standard companies, at the time of writing are devoting somewhere about two-thirds of their work to government output, as sub-contractors: one is making gearboxes for a lorry firm; another back axles; a third certain engine parts; while at least one is doing some ammunition work.

Talking of ammunition work, the Vauxhall company has put up an ammunition factory quite separate from its motor works, a performance that will be regarded as quite a feat of construction at any other time than the present.

In private car output the firms most affected have been those making cars too small to do what the government wants. The smallest cars taken have been the 16-horsepower Sunbeam, four-cylinders, 80 x 150 mm., and the 16-horsepower Vauxhall, 90 x 120 mm. In both cases these have been mainly used for ambulance work, though some are employed as staff cars. For most of the staff work something bigger is wanted, like the 25-horsepower Vauxhall, 95 x 140 mm., or the 20-horsepower Daimler, 90 x 130 mm.

Incidentally, no car with less than four speeds has been officially bought, though, of course, odd purchases of all kinds of cars have been made under individual pressure of circumstances. If we except an experimental order for sixty light cars to be used as two-seaters for some purposes not yet known, no order has been given in cold blood for anything smaller than the Sunbeam.

The 20-horsepower Daimlers, already mentioned, are being turned out, some as complete open cars, some as sort of light vans to carry 1120 lb. of material or men, for which there is seating accommodation. Though the Vauxhall people have supplied 16 horsepower they are at present devoting themselves wholly and solely to their 25-horsepower cars, 95 by 140 mm., and they, Wolseley and Daimler, are supplying some big cars for staff purposes; in some cases the staff cars have their seats so arranged that the car interior can be used as a sleeping apartment for staff officers. The royal naval air service is absorbing a goodly number of cars, mostly Talbots, and though a good few such cars as Vauxhalls are used a lot of these are armored. Rolls-Royce, Lanchester and Austin, among others, are turning out staff cars and armored cars, the latter in no small measure for Russian requirements. Humbers are making field kitchens, which is an engineer's rather than a body maker's job. Arrol Johnson has for a long time past been making such parts as maxim gun tripods, and Napiers are on gun parts, etc.

All 3 and 4-Tonners Commandeered

Further, practically all the output of 3 and 4-ton trucks throughout the country has been commandeered, for be it realized that the 3-ton subvention type of the British army to all intents and purposes is a 4-tonner for civilian work, while their 3,360-lb. class is capable of taking anywhere from 2 to 2½ tons. Indeed, many are building in no other sizes. Some few 5-tonners are being taken, but not many: they are too un-

wieldy, except for special purposes. The tendency, indeed, points rather to the absorption in the future of smaller types, such as 2-tonners.

But though demand exceeds the labor supply for every firm of any effectiveness in the country manufacturers are not without troubles. It is true that, selling only to government, they can reduce their selling costs, but labor dearth is having its effect, and the rise of price in material is feeding on its own growth. Yet in spite of this, automobile makers are being paid less by the government than they would be by their agents.

But with the substitution of many public buyers for a single government as customer dealing direct with the manufacturers, the dealer is having a very bad time. A good few of the smaller and less intelligent have already gone under, those who survive adapting themselves to present-day requirements. For instance, they are devoting more attention to the commercial vehicle, and some, realizing the unsatisfactory state of railway transport, for the railways have been taken over by the government, are contracting for motor transport. In some few instances, however, which have come to my notice they are handicapped with a lack of proper knowledge of working costs.

Price Question on Second-Hand Cars

The question of the second-hand vehicle is likely to assume proportions. Quite recently there was a trade debate on the possibility of fixing a minimum price for second-hand cars, though it was generally thought to be impracticable to saddle the public with restrictions. It is a question, however, whether the same impracticability applies to battle-worn cars after the war. The whole matter will lie in the hands of the government, and though not generally expressed it is felt that the government should treat with every consideration the interests of the automobile trade to whose help they owe so much in this campaign.

So far the most practicable suggestion is one advocating that since each manufacturer's reputation is dependent on the performance of his vehicles, each manufacturer should be appointed by the military authorities as agent for the sale of his own second-hand war vehicles. These would be turned over to him on the understanding that they would not be sold below a certain minimum price, and that no vehicle would be sent out without the manufacturer's guarantee of its sound condition.

Dearth of New Cars

Even now the second-hand car problem is with us, but at present rather from the opposite point of view, demand exceeding supply. It is said that the dearth of new cars, especially in the larger sizes, is sending up the price of the second-handers. The other day a man in the trade said he had advanced 17½ per cent. Comparison of the prices certainly shows a general rise, though in some cases, as, for example, Fords, 1915 second-hand prices strangely enough appear down on those of last year. From a careful comparison of prices of similar second-hand cars of this and last year 7 1-2 per cent advance for 1915 appears much the more correct general figure. We have heard a good deal about a coming car famine, but with the general public going very carefully in financial matters, and some 2,000,000 additional men away on military duty, this possibility is likely to be overrated.

N. A. C. C. Cross-Licensing Patent Plans Now Almost Completed

Sixty-Nine Companies Already Have Agreed to It—These Control Over 300 Patents—Rest of Ninety-Three Members Expected to Join in Agreement

NEW YORK, June 29—The cross-licensing plan recently formulated by the National Automobile Chamber of Commerce, whereby one automobile maker holding patents can enjoy reciprocal privileges with makers holding other patents, thereby avoiding needless patent litigation, has been practically assured success. To date sixty-nine companies of the ninety-three that are members of the N. A. C. C. have formally agreed to this cross-licensing plan, and six other companies have agreed to the cross-licensing principle but are awaiting action by their boards of directors. Other concerns have expressed approval of the plan and are awaiting action of their directors.

Action on this cross-licensing agreement was entirely voluntary on the part of any members and it was further provided that the plan would not be operative until sixty-one companies controlling in all 300 patents had executed the necessary document of agreement. This has now been more than accomplished.

Practically all members of the N. A. C. C. hold patents of one kind or another and this cross-licensing agreement is expected to bring about better business relationships, to reduce patent litigation, and also to leave the members free to expend their resources in developing scientific manufacturing, selling and advertising, rather than squandering them in patent law suits. It was expected that with few exceptions all of the ninety-three members of the N. A. C. C. would eventually be pledged in this cross-licensing scheme.

Committee in Charge

The patents committee in charge of this work includes, Messrs. C. C. Hanch, Studebaker; W. H. VanDervoort, Moline; Windsor T. White, White; Wilfred C. Leland, Cadillac, and Howard E. Coffin, Hudson.

The plan of the cross-licensing agreement provides that each member give licenses under the patents he owns to all other members of the chamber, who do likewise. For example: A company may have only five or six patents, yet that company is certain, upon entering the agreement, to have reciprocal rights to not fewer than 300 patents owned by other members.

While each member may consider its patents of value and important, it could not but feel that they were of less importance than the patents owned by the balance of the industry. It is just that broad situation which has made possible the success of the plan.

The agreement covers an arrangement by which members are to exchange free licenses under all their motor vehicle patents, with the exception of design patents and certain patents on trucks, tractors, fire engines and ambulances, and with the further exception of basic patents of revolutionary character that may be developed within the member's own organization. Although a large number of patents in the chamber are of vital importance, the greatest trouble has arisen from patents of trivial character and minor importance, the evils of which are overcome by this agreement when it becomes operative, whereas there is still the same inducement as there always has been for real advancement in the art by the provision which excepts patents of revolutionary character.

The Agreement

In a brief issued by the N. A. C. C., the main points of the agreement are given as follows:

1—It is obviously for the interests of the manufacturing members of the Chamber to remove the possibility of patent litigation between them.

2—No matter how many patents any single member may own, it is certain that license rights under the aggregation of patents which will come under this agreement will be much more valu-

(*Continued on page* 45)

Gasoline Price War in Missouri

Reduced 10 Cents in 18 Months —Small Dealers Hit Hardest by S. O. Cuts

ST. LOUIS, MO., June 26—There is a gasoline price-cutting war on in St. Louis and surrounding territory, but in the opinion of the independent dealers it is only a sham battle between the Standard company and the Pierce Oil Corp. with the two-fold purpose of freezing out the small dealers and at the same time cornering the oil surplus.

In eighteen months the price of gasoline has been reduced by 1 cent cuts from 17½ cents a gallon to 7 9/10 cents a gallon. In each case the cut was first announced by the Standard Oil Co. This usually was followed on the next day by the Pierce company's announcement of a similar cut. The independents by necessity then met the new price—only to be forced to meet another cut of 1 cent a few months later.

At present the refined product is sold to the consumer here for 8 9/10 cents a gallon in lots of from 10 to 100 gallons. In 100-gallon lots—as it is bought by many automobile owners—gasoline is sold here now for 7 9/10 cents. Quantity prices were introduced here only a few months ago.

The following view of the so-called war, which is characteristic of local independent dealers, is given by F. C. Bretsnyder of the Bell Oil Co., an officer in the national organization of independents:

"During the last two years there has been an over-production of crude oil. This gave the Standard Oil Co. an excuse for cutting the price of the crude product gradually from $1.05 a barrel to 40 cents a barrel, Pennsylvania crude from $2.50 to $1.35 a barrel.

"The time came when with each Standard Oil cut in the price of gasoline one or more small dealers went out of business. Even now the larger independent dealers are compelled to turn their business to other lines such as lubricating oils in order to survive the price-cutting sham battle between the Standard and Pierce companies.

"When these two companies get gasoline down to the price at which it will suit them to buy they will corner all the surplus; then the price will begin to go up again. The independents see through this scheme, but are powerless to stop it as the Standard Oil's operations are wholly within the law. Of course the independents are organizing more and more to protect themselves and I think we have found ways of holding out until the price-cutting war is over."

Mr. Bretsnyder denied, however, that the independents are co-operating to facilitate the merchandising of their wares, except in so far as the export committees and organizations are concerned.

Market Prices Steady

NEW YORK CITY, June 29—Changes this week in the market prices were exceptionally few. Changes, if any, were higher. Lead went up 50 cents per 100 lb., while electrolytic and Lake coppers went up ¼ and 1 cent, respectively. Fine Up-River Para went down ½ cent. The rest of the products remained throughout the week unchanged.

The tin market was easy with activity in London. The demand for aluminum is limited and the market is nominal. There was a fair demand for lead.

The rubber market was firm with no new developments. The trade in various kinds of manufactured rubber continues good.

The oils and lubricants markets were steady throughout the week.

Four-Wheel Drive Adds

CLINTONVILLE, WIS., June 25—The Four Wheel Drive Co. has broken ground for a large addition to the present plant. The new building will be built adjoining the present factory and will cover an area 100 by 185 ft. The structure will correspond in construction to the present buildings, will be brick and steel, and fireproof. It will be used for assembly poses.

At the same time additional machine shop facilities will be added covering a like space.

This addition to the present plant is the fourth building erected in the last 3 years. At the present time the company is turning out approximately seventy-five 3- and 5-ton chassis a month. The enlarged factory and improved facilities will permit an output of 100 to 125 trucks a month.

A day and night shift has been working several months.

Duplex Truck to Add

CHARLOTTE, MICH., June 24—The Duplex Power Car Co., which for some time has contemplated increasing its capital stock from $100,000 to $200,000, will place only about $25,000 of the stock upon the market, the remainder having been subscribed for. The concern intends to enlarge its plant and add machinery.

Chase 117 per Cent. Gain

SYRACUSE, N. Y., June 21—A financial report covering the affairs of the Chase Motor Truck Co., of this city, for the first 5 months of the present year shows an increase in its truck business of 117 per cent. as compared with the same months a year ago.

$175,000 to Lozier Creditors

DETROIT, MICH., June 28—Within a few days the Detroit Trust Co. will pay a second dividend of 5 per cent, amounting to about $175,000, to the creditors of the old Lozier Motor Co. About two months ago the first payment of a 5 per cent dividend was made.

Durant Takes on 'Frisco Chevrolet

SAN FRANCISCO, CAL., June 26—Norman DeVaux and R. C. Durant have formed the Chevrolet Motor Co. of California and will distribute that car throughout the Pacific Coast. Durant, who is the son of W. C. Durant of the Chevrolet Motor Co., will make his headquarters at 1212 S. Olive Street, Los Angeles, and will have charge of he company's Southern business. DeVaux will make his headquarters at 1622 Van Ness Avenue, this city, and will manage the Northern business.

Mohawk Motor Truck Co. Incorporated

RAVENNA, OHIO, June 24—The Mohawk Motor Truck Co., Ravenna, Ohio, has been incorporated under the laws of Ohio, with a capital of $25,000, for the purpose of manufacturing motor trucks. The new corporation will take over the plant and personal property of the Ravenna Motor Truck Co., which has been

Daily Market Reports for the Past Week

Material.	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum	.32	.32	.32	.32	.32	.32	.....
Antimony	.36½	.36½	.36½	.36½	.36½	.36½	.....
Beams & Channels, 100 lbs.	1.31	1.31	1.31	1.31	1.31	1.31	.....
Bessemer Steel, ton	19.00	19.00	19.00	19.00	19.00	19.00	.....
Copper, Elec., lb.	.20	.20	.20	.20	.20	.20	.....
Copper, Lake, lb.	.20¾	.20¾	.20¾	.21	.21	.21	+.00¼
Cottonseed Oil, bbl.	6.00	5.95	5.92	5.95	5.95	6.01	+.01
Cyanide Potash, lb.	.24	.24	.24	.24	.24	.24	.....
Fish Oil, Menhaden, Brown	.40	.40	.40	.40	.40	.40	.....
Gasoline, Auto, bbl.	.12	.12	.12	.12	.12	.12	.....
Lard Oil, prime	.90	.90	.90	.90	.90	.90	.....
Lead, 100 lbs.	5.25	5.50	5.50	5.75	5.75	5.75	+.50
Linseed Oil	.62	.62	.62	.62	.62	.62	.....
Open-Hearth Steel, ton	19.50	19.50	19.50	19.50	19.50	19.50	.....
Petroleum, bbl., Kans., crude	.40	.40	.40	.40	.40	.40	.....
Petroleum, bbl., Pa., crude	1.35	1.35	1.35	1.35	1.35	1.35	.....
Rapeseed Oil, refined	.85	.85	.85	.85	.85	.85	.....
Rubber, Fine Up-River, Para	.63½	.63	.63	.63	.63	.63	—.00½
Silk, raw, Ital.	3.80	..	3.75	..	..	3.75	—.05
Silk, raw, Japan	3.32½	..	3.35	..	..	3.37½	+.05
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	41.50	41.38	41.50	41.50	41.50	41.50	.....
Tire Scrap	.04¾	.04¾	.04¾	.04¾	.04¾	.04¾	.....

in business for some time. At a meeting held recently officers and stockholders decided to reorganize and to change the name of the concern.

A statement given out by the officers of the company stated that the plant would be operated 24 hours a day in the future.

The incorporators of the new concern are S. C. Dougherty, E. E. Jones, E. W. Chapman, Herman Hill and W. K. Dougherty.

Reo Athletic Assn. Formed

LANSING, MICH., June 24—The Reo Motor Car Co. has taken over and is now managing the Reo Athletic Association, J. M. Amiss being in charge. There is to be no membership arrangement nor annual fees, every Reo employee being entitled to the privileges of the association building and grounds. The rooms will be reserved to Reo employees and their families. Three double tennis courts are now being prepared and tennis and other athletic tournaments will be held during the summer.

Mutual Electric Moves to Detroit

DETROIT, MICH., June 23—The Mutual Electric & Machine Co., Wheeling, W. Va., has leased the building formerly occupied by the Detroit Electric Starter Co., Fort Street, West, and Fourth Street, and will move practically all of its plant here. While the concern's principal business is that of making switchboards and switches, it also makes materials used in the making of self-starters. The officials who will locate here are General Manager H. J. L. Frank, Sales Manager L. H. Frank, Chief Engineer F. A. Hagan and Consulting Engineer G. H. Morse.

Security Prices Normal

Break in U. S. Rubber Due to Rumors on Common Dividend Action

NEW YORK CITY, June 28—Security quotations last week held strong with few changes. Tire issues again featured the market with Firestone and U. S. Rubber in the fore. Firestone common showed a 13 point gain and a new high mark, 503, while U. S. Rubber went down 13 points, the break occurring on acount of rumors that the dividend on the common might not only be reduced but passed altogether, so as to give the company an opportunity to accumulate the large supply of working capital needed in connection with the development of great activity in the business.

Studebaker common during the course of the week made a new high mark, 80. Froh the break that followed the declaration of the 5 per cent dividend, there has been a 20 point rally. It is expected that the next payment will be at the rate of 6 per cent per annum. The preferred, which went off five points last month, is now back to about its previous high.

Most of the stocks picked up on Saturday and a few of them showed substantial gains at the close. Goodrich common and preferred, ½ and 1 points, respectively; Maxwell common went up 4 points; Goodyear common rose 2 points; and Reo Truck closed with a ⅝-point gain.

Walpole Stockholders Files Petition

BOSTON, MASS., June 28—The Walpole Tire & Rubber Co. case, which has been before the United States district court for nearly two years, took a new turn today, when M. G. Sollers, one of the preferred stockholders, filed a petition asking permission to intervene in the case for the purpose of taking appeals from decrees of the court ordering the sale.

M. and S. Differential for Fords

KANSAS CITY, MO., June 24—The M. & S. Gear Co., this city, are announcing that they are now in a position to make deliveries on their differential for Ford cars. The feature of the differential is that by the use of spiral gearing the power is equally applied to both wheels under all conditions. The gear is perfectly interchangeable with the bevel-gear type on the Ford at the present time and sells for but a trifle more than the Ford outfit.

Accessory Jobbers Meet July 21

CHICAGO, ILL., June 28—The National Association of Automobile Accessory Jobbers will hold its next meeting in this city July 21. Present indications are that a good attendance will mark this first meeting to start the organization of the association. Suite 1813 to 18, City Hall Square Building, has been selected as headquarters.

Goodyear Continues Refund Offer

AKRON, O., June 26—The Goodyear Tire & Rubber Co. announces a continuance through July, August and September of the offer to refund the entire purchase price if Goodyear S-V tires fail to prove superior to competing makes.

Automobile Securities on New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Ajax-Grieb Rubber Co. com	220	..	300	..	..
Ajax-Grieb Rubber Co. pfd	99	103	101	110	..
Aluminum Castings pfd	98	100	98	100	..
J. I. Case pfd	80¾	90	70	80	..
Chalmers Motor Company com	99	103	92	93½	— ½
Chalmers Motor Company pfd	95½	98½	95	97	..
Electric Storage Battery Co	51	51½	52	54	—2
Firestone Tire & Rubber Co. com	300	304	503	510	+13
Firestone Tire & Rubber Co. pfd	108	109½	111	..	+1
General Motors Company com	90	92	152	154	+1
General Motors Company pfd	92½	95	101	102½	..
B. F. Goodrich Company com	23⅛	24	51½	53½	+ ½
B. F. Goodrich Company pfd	86¼	87¼	101	102	+1
Goodyear Tire & Rubber Co. com	166	172	265	274	+2
Goodyear Tire & Rubber Co. pfd	96½	98½	105	106¼	—1
Gray & Davis, Inc., pfd	98	102	..	..	..
International Motor Co. com	..	4	13	14	..
International Motor Co. pfd	3	9	35	37	+1
Kelly-Springfield Tire Co. com	58	60	159	162	+1
Kelly-Springfield Tire Co. 1st pfd	76	80	86	87	..
Kelly-Springfield Tire Co. 2d pfd	94	100	160	165	..
Maxwell Motor Co. com	13½	14	39	41	+4
Maxwell Motor Co. 1st pfd	40	41	84	86	—2
Maxwell Motor Co. 2d pfd	16¾	17½	34	35	—3
Miller Rubber Co. com	..	..	185	187	..
Miller Rubber Co. pfd	..	..	104	106	..
New Departure Mfg. Co. com	126	128	..	..	..
New Departure Mfg. Co. pfd	106	..	..	..	..
Packard Motor Car Co. com	103	..	104	..	..
Packard Motor Car Co. pfd	97	100	96¼	100	—2¾
Peerless Motor Car Co. com	18	25	67	70	..
Peerless Motor Car Co. pfd	..	62½	94	96	..
Portage Rubber Co. com	..	40	35	39	..
Portage Rubber Co. pfd	..	90	92	93	..
Reo Motor Truck Co	10½	11½	15⅛	15¾	+ ⅝
Reo Motor Car Co	17½	18½	..	31	..
Splitdorf Electric Co pfd	40	50	..	..	..
Stewart-Warner Speed. Corp. com	47½	48½	68	68⅜	— ½
Stewart-Warner Speed. Corp. pfd	98½	99½	105	..	..
Studebaker Corporation com	28	28⅛	78	80	+2½
Studebaker Corporation pfd	80	83	98½	100	+ ½
Swinehart Tire & Rubber Co	85	86	77	79	—2
Texas Company	143½	144	124	128	..
U. S. Rubber Co. com	58	58½	51	53	—13
U. S. Rubber Co. pfd	102⅛	103	106	107	— ½
Vacuum Oil Co	218	221	197	199	—1
White Company pfd	107	110	103	108	..
Willys-Overland Co. com	78	81	128	129	—1
Willys-Overland Co. pfd	92	95	102½	103½	— ½

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Chalmers Motor Co. com	101	107½	90	95	—1½
Chalmers Motor Co. pfd	94	97	93½	97	—1¾
Continental Motor Co. com	..	180	180	..	+5
Continental Motor Co. pfd	..	75	82	86	..
General Motors Co. com	91	93	151½	153	—1½
General Motors Co. pfd	92½	95	101½	103½	+ ½
Maxwell Motor Co. com	13¼	14¼	39	42	—3½
Maxwell Motor Co. 1st pfd	40	42	84½	87	—1¾
Maxwell Motor Co. 2d pfd	16½	18	35	38	—1½
Packard Motor Car Co. com	103	..	106	..	+3
Packard Motor Car Co. pfd	97	100	97¼	100	+1
*Reo Motor Car Co	17¾	18½	..	30½	—2
*Reo Motor Truck Co	11½	12½	15⅛	15¾	+ ¾
Studebaker Corporation com	..	..	78	80	+2¼
Studebaker Corporation pfd	..	..	98	100½	—1¾

INACTIVE STOCKS

*Atlas Drop Forge Co	19	..	26	26	..
Ford Motor Co. of Canada	..	555	1000	..	..
Kelsey Wheel Co	185	..	200	..	..
*W. K. Prudden Co	..	20½	19½	21	..
Regal Motor Car Co. pfd	20	..	..	25	..

BONDS

General Motors, notes, 6s, 1915	101	102	..	..	..
Packard Motor Co. 5s, 1916	95	98½	98¼	..	..

*Par value, $10; all others, $100 par value.

Goodrich Truck Tire Policy

Favors Small Singles to Duals—Large Duals Over Too Large Singles

AKRON, OHIO, June 29—A new step in the policy of the Goodrich Tire Co., of this city has been suggested by S. V. Norton, sales manager, for the truck tire department in which the company recommends the use of 5- and 6-inch single solid tires in preference to 3- and 3½-in. duals; but where singles are larger than 7 in., it is more desirable to use 4-, 5- and 6-in. duals as the conditions demand.

"Momentary overloading of solid truck tires," says Mr. Norton, "which ruptures the rubber by displacing it beyond the limits of its ability to recuperate, is the cause for more tire failures than probably any other factor.

"Momentary overloading means excessive strain or shock on the tire at certain points, due to the tire being forced to bear in one way or another more load for an instant than it is intended to support. This may be due to road inequalities, or other conditions. The result is the normal displacement and the creation of undue internal friction and heating which is not quickly radiated, so that the tire is damaged beyond repair.

Injuries to Duals

"In the smaller dual sizes those made up of less than 4-inch units neither tire is itself large enough to withstand these momentary loads, such as when one of the singles comprising the dual set, takes the entire load and the other is not touching the ground. A modification of these conditions happens on crowned roads where the curve of the surface places more load on the inner tire than the outer. The net result of this condition in which the load is alternately shifted from one to the other is a permanent rupture."

Evils of Large Tires

Mr. Norton further believes that the best results come from a happy medium and consequently for single tires larger than 7-inch sizes are used, the displacement on tires with a load takes place in such direction that it causes undue internal friction and the generation of heat which is not quickly radiated when the tire section is too large.

Many advantages are advanced for the use of 5- and 6-in. singles in preference to 3- and 3½-in. duals, some of which are as follows: One, saving in tire cost. Two, saving in wheel cost, due to narrower felloe, narrower felloe band, and other changes in wheel design. Three, saving in unsprung weight of wheel, tire and metal equipment. Four, saving in applying one tire to the wheel as applying two. Five, larger tire units will better absorb uneven road surfaces, and better compensate for excessive road crown thereby keeping the whole tire always in use rather than alternately one tire and the other as is the case with small duals, neither of which is large enough to bear the strain alone. Six, more readily fitted with non-skid chains. Seven, better trackage of rear wheels with front wheels. Eight, greater height of rubber tread, and consequently more cushion and increased life in tires, greater than 3 in., which are ¼ in. lower than regular sections of greater width. Nine, less leverage strain on the axle and bearings, due to the decreased width of wheel tread.

Mr. Norton believes that the schedule of tire ratings now in use which rates duals higher than the equivalent singles is open to criticisms and this rating may be altered in the near future. He belies that dual tires cannot possibly have a greater carrying capacity than twice that of a single tire of which it is composed, and hence the error in the existing ratings.

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Davis J. I. Case Mechanical Engineer

MILWAUKEE, WIS., June 24—R. E. Davis, instructor in automobile and gas engine practice in the Milwaukee continuation school, Milwaukee, Wis., will retire July 1 to become mechanical engineer in the staff of the J. I. Case T. M. Co., Racine, Wis. Mr. Davis was formerly associated with Packard, Marmon, F. A. L. and Midland, and in 1913 took charge of the short course in the care and operation of automobiles instituted by the Iowa State College. In the fall of 1914 he came to Milwaukee to take charge of the motor course in the continuation schools. In his new position he will be the point of contact between the engineering department and the service, sales, advertising and publicity departments. He is to be succeeded at Milwaukee by H. L. Connell, formerly of Detroit, and well known member of the S. A. E., who came to Milwaukee last February to supervise the short course in motor car practice in the continuation school.

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Saxon Drive-Away Day July 15

DETROIT, MICH., June 28—The Saxon Motor Co. has promoted a drive-away day for dealers to be held July 15. Saxon sixes exclusively will be driven away. To make the event more interesting a silver loving cup will be given to the dealer who in driving home makes at least 100 miles and consumes the smallest amount of gasoline and oil.

Tire Lessons from Chicago Race

Tires Destroyed at Over 100 M.P.H.—Board Track Better than Brick

By John F. Palmer

CHICAGO, ILL., June 26—An interesting side light on the long string of records that went to smash at the running of the Chicago speedway to-day is the bearing a wood surface appears to have on tire wear and practice.

As at Indianapolis all of the first ten cars to finish used cord tires and a comparative analysis of performance under the differing conditions obtaining should be interesting and possibly instructive.

First: Weather conditions were much the same, race day being cloudy and cool and preceded by much rain in both instances. Second: The cars contesting at Chicago ran true to the form shown at Indianapolis, Rickenbacker's Maxwell being the one exception. The practice and tuning up made possible by the time interval between the two races, enabled the Maxwell to justify the hopes had of it and stamping its design in the front rank of race car engineers. Third: Except change of carbureters in a few instances, equipment was identical.

What then made possible the phenomenal jump in average speed at Chicago over Indianapolis from 89.84 to 97.58 m.p.h.?

In my opinion the two chief factors were surface and banking, wood laid lengthwise of the track offering less rattling resistance and the minimum of vibration due to the longitudinal disposition of the joints, this contributing also a measurable resistance to skidding on the turns while the banking carried to an angle correcting side slip up to 90 m.p.h. contributed not only greater safety but automatically increasing traction by adding the enormous pressure of centrifugal force to the weight of car approximately at right angles to the axis of wheel rotation. This turned a force, that at Indianapolis made for danger skidding and tire wear, into added power efficiency that lessened slips.

100 M.P.H. Destruction

Curiously enough tire failure only began when the speed approached 100 m.p.h., when tires were literally torn in two by the complicated stresses introduced by taking turns at a speed higher than the track was designed for in combination with heavier tractive duty made possible by the high banking.

The foregoing is not offered as my final judgment but as an interesting line

(*Contined on page* 43)

Packard Stars at Uniontown

Breaks All Previous Records on 3-Mile Hill, Making It in 3:27 2/5

UNIONTOWN, PA., June 24—All previous records were broken at to-day's Uniontown hillclimb, when a Packard, driven by Charles Johnson, president of the local automobile association, traveled up the mountain side, a distance of 3 miles, in 3:27 2/5. The average grade for the course runs 7.754 per cent. The annual hill climb is held under the direction of the Uniontown Motoring Association.

A Chalmers, driven by A. E. Walden, won in the Class E, Non-Stock race, this being open to Class C cars with a piston displacement of 230 cu. in. and under. His time for the climb was 3:50.

Ralph De Palma participated in both races but failed to come in better than fifth in any of them. In the Class D, Non-Stock Free-for-All event, won by Johnson, he finished sixth in his Mercedes Special, his time being 3:55 2/5. In this event his magneto broke down, and his going was somewhat slowed down at times when the crowd stood too near the course.

The attendance was about 30,000.

Lessons from Chicago Race

(*Continued from page* 42)

of reasoning that to me seems to offer at least one possible explanation of the proved superiority in speed possibility of the wood over the brick surface.

Again: There is a doubt of the superiority of the sand paper surface of brick over the wood purely from a traction standpoint. The wood, however, undeniably conserves tire treads up to 90 m.p.h., as is evidenced by the performance of the slower cars, notably Grant's Sunbeam, though in his case there was a contributing element in the smoother flow of power and lighter impulses of his six-cylinder motor; and if banking is such a factor as it seems, the only limit to speed possibility and tire dependability is scientific banking that will reduce the tire strains to the comparatively simple ones, of power transmission and air pressure.

I can see large possibility of better coordination of track and tire design to the end that pure speed may reach its highest development and shall welcome further experience along this line.

Burman's Bakersfield Records Allowed

NEW YORK CITY, June 28—The following official records, made at Bakersfield, Cal., on January 3, 1915, were allowed and accepted at the meeting of the contest board of the A. A. A., held June 18:

ONE MILE CIRCULAR DIRT TRACK RECORDS

Distance	Time	Driver	Car
10	8:16.4	Burman	Peugeot
15	12:23.2	Burman	Peugeot
20	16:25.6	Burman	Peugeot
25	20:28.8	Burman	Peugeot
50	40:57.8	Burman	Peugeot

Elgin Entry Blanks Recalled

CHICAGO, ILL., June 28—*Special Telegram*—The entry blanks for the Elgin road races scheduled for August 20 and 21 were recalled to-day by Chairman George Ballou of the Contest Board, of the Chicago Automobile Club, in order to incorporate in them the change made recently in the A. A. A. three-car rule, which was amended so as to permit five cars to start in any race, provided only three are nominated by the manufacturer the blanks will be re-issued this week.

Arizona Grand Prize

PHOENIX, ARIZ., June 25—The Arizona Grand Prize race of 150 miles will be held on the 1-mile dirt track at the Fair grounds here November 20, which will be the last day of the State Fair. The Fair commission is promoting the event, which will be under A. A. A. sanction.

Results of Uniontown Hillclimb

EVENT NO. 2—CLASS E NON-STOCK. OPEN TO CLASS C CARS WITH A PISTON DISPLACEMENT OF 230 CU. IN. AND UNDER

Car	Owner	Driver	Time	
Chalmers	Keystone Auto Co.	A. E. Walden	3:50	First
Saxon	Keystone Auto Co.	M. A. Crocker	4:4	Second
Buick	A. D. Spencer	A. B. Spencer	4:4 3/5	Third
Maxwell	William Burley	C. M. Hansel	4:14 4/5	Fourth
Hispana Suiza	Loveland Co.	Ralph De Palma	4:30 4/5	Fifth
Morse Cyclecar	Morse Cycle Car Co.	E. Bennett	6:9 3/5	Sixth
Ford	Guy Woodward	Guy Woodward	9	Seventh

EVENT NO. 3—CLASS D NON-STOCK FREE-FOR-ALL.

Car	Owner	Driver	Time	
Packard	C. W. Johnson	C. W. Johnson	3:27 2/5	First
Simplex	A. C. Smith	I. P. Fetterman	3:46 3/5	Second
Marmon	Poffinberger M. C. Co.	W. L. Poffinberger	3:47 4/5	Third
Chalmers	Keystone Auto Co.	A. E. Walden	3:48 1/5	Fourth
Dickinson Special	J. W. Dickinson	J. W. Dickinson / R. E. Wier	3:54 4/5	Fifth
Mercedes Special	Ralph DePalma	Ralph De Palma	3:55 2/5	Sixth
Buick	C. W. Johnson	Roy Stentz	4:15	Seventh
Lozier	H. E. Cupps	H. E. Cupps	4:16 3/5	Eighth
Overland	T. S. O'Rorke	T. S. O'Rorke	6:13 4/5	Ninth

170 Miles Per Tire

Chicago Speedway Eclipses Indianapolis Where 100 Miles Per Tire Was Average

CHICAGO, ILL., June 26—To-day's inaugural of the new Chicago speedway served to prove among the many questions which were subject of speculation, the fact that the 2-mile board track here is considerably easier on tires than is the Indianapolis speedway. This may be shown by the fact that on the twelve cars which finished to-day's race only forty-one new tires were required, as against forty-four new tires taken on by the eleven cars which finished the Hoosier classic. This means that in the 6000 miles covered by the finishers to-day it took one new tire for each 146 miles, whereas at Indianapolis the 5500 miles took a new tire for each 100 miles; that is, the tires ran 46 per cent further on the board oval than they did on the brick.

Forty-nine Tires Used

Forty-nine tires in all were used in the 8370 miles of running of the twenty-four cars in to-day's race. This is an average for the total number of starters of 170 miles per tire. The finishers in to-day's race used just over three new tires per car, whereas at Indianapolis they took four tires per car.

To-day's event was a complete victory for Silvertown cords, as the record for tire mileage in racing made by the Goodrich company with its cord tires at Indianapolis was shattered to-day when the same make of tires made a showing even better than was expected on the basis of the Indianapolis performance.

Grant Made No Changes

The palm must be handed to Grant and his six-cylinder Sunbeam on tire performance, for Grant not only did not change a tire, but made no stop for any reason whatsoever during the race. His feat, however, was duplicated by three other cars, so far as tire consumption was concerned, Alley in the Duesenberg, Babcock in the Peugeot and Cooper in the Sebring, all running the entire 500 miles without a tire change.

FALL SHOW ANNOUNCEMENTS

COLUMBUS, OHIO, June 28—Plans are progressing for the fall automobile show to be held by the Columbus Automobile Show Co., at the Ohio State Fair, August 30 to September 3. The show will be something out of the ordinary as one whole building has been leased by the company to display pleasure and commercial vehicles.

The building has a floor space of 40,000 sq. ft., all of which will be used for the showing of automobiles. Practically all of the space has been sold. It will be the first attempt to hold an automobile show on the State fair grounds.

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LOS ANGELES, CAL., June 28—The Motor Car Dealers' Association of Los Angeles, has set the date for its fall show. This will be held during the week of September 18-25 in the Shrine Auditorium.

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WESTERVILLE, OHIO, June 28—A large number of automobile agents of Columbus will give an automobile show at Westerville, Ohio, located about a dozen miles to the northeast, July 3. The show will be given in conjunction with the usual Fourth of July celebration and will be held on the principal street of the village. Spaces will be marked off on the paved streets and it is believed that about thirty different makes will be displayed. The idea is a new one and is being tried as an experiment.

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Missouri Ad Law in Effect

ST. LOUIS, MO., June 24—Missouri's honest advertising law, created by the last General Assembly is effective. The law applies to every form of business and prohibits the mis-statement of fact in any form of advertising. Newspapers, posters, circulars and letters are specifically mentioned. Fines and jail penalties are provided for violations of the law.

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Capital Stock Increased

DETROIT, MICH.—Consolidated Car Co., from $100,000 to $200,000.

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DETROIT, MICH.—United States Auto Supply Co., from $5,000 to $75,000.

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Four-Story Pierce Addition

BUFFALO, N. Y., June 26—The Pierce-Arrow Motor Car Co. will construct a new concrete flat-slab building on its site here at 1695 Elmwood Avenue. It will be four stories high, 410 ft. long, and 61 ft. wide.

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Princess Leases Old Saxon Plant

DETROIT, MICH., June 28—The Princess Motor Car Co., organized in June, 1914, and located at 348 Clay Avenue, has leased the former plant of the Saxon Motor Co., Bellevue Avenue, and will move to it in a few days.

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Gets New Era Contract

BATTLE CREEK, MICH., June 24—H. E. Petrie, who in addition to conducting the business of the Independent Garage, makes foot accelerators for Ford cars, has received an order for 70,000 from the New Era Spring & Specialty Co., of Detroit.

Standard Service Advocated

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Service Managers Would Restrict Dealer's Parts—Different Truck and Car Service

DETROIT, MICH., June 29—*Special Telegram*—Ninety service managers and other representatives of fifty automobile and truck manufacturing concerns were in attendance at to-day's session of the service managers convention called here by the National Automobile Chamber of Commerce. Papers and discussions dealt mainly with the phases of the relation between the factory service department and the dealer, although there was much airing of views as to what the owner should expect in the way of service.

Co-operation Needed

In opening the two-day meeting, Alfred Reeves, general manager of the N. A. C. C., spoke for the same interchange of thought among the service men as is being practised by the heads of concerns in the organization.

Alvan Macauley, Packard vice-president and general manager, welcomed the delegates and said that service and service policy are the vital part of the business, and whether or not the makers get this down to a reasonable basis and hold it there will largely be a governing factor in their staying in business. That a standard policy is needed he is positive, and believes it necessary to survival.

Limiting Dealer's Parts

The consensus of opinion was that dealers' parts orders should be censored. That is, the amount ordered should be cut down if the manufacturer thinks such a large requisition not commensurate with the number of cars the dealer sells. It did not seem necessary for a dealer to carry parts for cars over two years old, the maker carrying these. A campaign of education seems advisable to get dealers to carry proper parts stocks.

It was quite generally conceded that there should be a standardized plan for handling parts accounts with dealers, but the methods are about as many as there are manufacturers.

Discussion of the subject of how the manufacturer can satisfy himself that the dealer who receives a credit installs the part in the customer's car without charge brought only the one answer, that, the customer should be notified of such credit to the dealer.

Owner's Service

What constitutes service to the owner was dealt with by Charles Gould, Maxwell service manager, who said that the four essentials to service are the carrying of repair parts, efficient repairs, supervised instruction and co-operation between dealer and owner as was to be expected, there was much difficulty in defining service, many definitions being proposed.

Committees will be appointed by Mr. Reeves to report on the various questions brought up by the papers and discussions, and strenuous effort will be made to get at the difficult matter of arriving at a standard service policy.

Cars and Trucks Differ

Morning and afternoon sessions Wednesday will close the meeting. Among the important subjects to be discussed are the reasons why there should be different service policies for passenger cars and trucks, Mr. Macauley reading a paper dealing with the question, Do Free Inspection and Adjustment Legally Extend the Manufacturer's Warranty. Pierre Schon, service manager General Motors Truck Co. will answer this.

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N. A. C. C. Service Convention Opens

DETROIT, MICH., June 28—Forty-nine automobile manufacturers are represented at the 2-day service manager's convention promoted by the National Automobile Chamber of Commerce which opened its sessions this morning at the Hotel Statler. Eighty-four men prominent in the trade, including presidents, general managers, and sales and service managers are listed to take part in the discussions of the following important papers:

"Should there be a Standardized Plan for Handling Parts Accounts with Dealers?" by A. H. Ransen, manager of the Parts Order Department of the Studebaker Corp. "How Can Manufacturers Assist in Preventing Dealers Overstocking and being Obliged to Stock Obsolete Parts?" by C. W. Matheson, Director of Service, Dodge Bros. "Should Manufacturers Encourage General Repairshops by Selling Them Parts?" by J. A. Harris, Jr., Advertising Manager White Co. "How Can the Manufacturer Satisfy Himself that the Dealer Who Receives Credit Installs the Part in the Customer's Car Without Charge?" by E. T. Klee, Service Manager, Stutz Motor Car Co. "What Constitutes Service to the Owners?" by Charles Gould, Manager of Service, Maxwell Motor Co. "Why a Standard Service Policy Should be Adopted by All Members for the Benefit of the Car Builder," by A. B. Hansom, Manager Directing Service Division, Chalmers Motor Co. "Should the Dealer's Service Policy Go Farther than the Manufacturer's Warranty, and If So in What Respect?" for open discussion. "Should There be Different Service Policies for Passenger and Commercial Vehicles and Why?" by Alvan Macauley, vice-president, Packard Motor Car Co. "Do Free Inspection and Adjustment Legally Extend the Manufacturer's Warranty?" by Pierre Schon, Service Manager, General Motors Truck Co. "Advantages of Issuing Books of Coupons Entitling Owners to a Specified Amount of Repair Work Free."

Speedway Organization Incorporated

Speedway Assn. of America formed, Officers Elected—Will follow Baseball Ideas

CHICAGO, ILL., June 25—*Special Telegram*—Seven representatives of the Indianapolis, New York and Twin City speedways met here this afternoon, adjourned the meet at Hammond, Ind., a Chicago suburb, this evening and there effected the permanent organization of the Speedways Assn. of America by filing its corporation papers with the Secretary of State of the Hoosier commonwealth and electing officers and a board of managers.

The Speedway Assn. of America was born at Indianapolis just prior to this year's Hoosier classic. Representatives of the Indianapolis, Twin City, New York, Tacoma, Sioux City, Omaha and Chicago speedways were in attendance and a temporary organization was effected. Not until the association had been incorporated, however, was the organization in a position to start its campaign for the advancement of speedway racing and to take such important action was the purpose of to-day's session.

Edward E. Gates, chief attorney for the Federal baseball league and a resident of Indianapolis acted for the speedway associations drawing up the incorporation papers and filing them this morning. As soon as word was received that incorporation papers had been granted the seven representatives boarded a train for Hammond where the first stockholders meeting was held, the incorporation laws of Indiana stipulating that a company incorporated in that State must hold its first stockholders' meeting within the boundaries of that commonwealth. At the stockholders' meeting a constitution and by-laws were adopted and the following officers elected:

Temporary Board

President, Charles W. Sedwick, Indianapolis; vice-president, James C. Nichols, New York; secretary and treasurer, James A. Allison, Indianapolis; board of managers: Carl G. Fisher, Indianapolis; Jas. A. Allison, Indianapolis; F. H. Wheeler, Indianapolis; Charles W. Sedwick, Indianapolis; James C. Nichols, New York; Dr. C. E. Dutton, Minneapolis, and D. L. Wheeler, Minneapolis.

Although Chicago, Tacoma, Sioux City and Omaha were not represented at to-day's meeting officials of these four tracks agreed to become members of the association at the time of Indianapolis session and admission blanks have been sent them. As soon as they apply for admission the board of managers will be changed in order that these four tracks may have representation on the board.

The chief aim of the speedways association is that of mutual protection and co-operation and its motives are not antagonistic to drivers, as many have been led to believe.

Adopts Baseball Ideas

Each year it will adopt a schedule so that there will be no conflicts in dates, it also will be in a position to buy racing cars, a very scarce commodity at the present time, and will appoint a common representative to visit Europe and engage foreign drivers not for one race but for all contests promoted during the season. It will also classify speedways and put a stop to the practice of one promoter hanging up a larger purse than another in order to attract entries.

Objects of Organization

The paramount aims of the new organization are best expressed in the following excerpts from the speedways association by-laws:

1—The objects of the association are to govern, contract and manage speedways for speed contests or other expeditions.

2—To secure the co-operation and participation in the same.

3—To encourage and promote the development, use and sale of motor cars and to promote speed contests as a pastime in America and other countries, and to surround it with safeguards such as will insure public confidence in its integrity and methods and improve the standard of skill and sportsmanship of the participants therein.

4—To establish uniform rules and regulations for such speed contests and exhibitions and for the safety of the drivers and public.

5—To protect the property rights of those engaged without sacrificing the spirit of competition.

6—To promote the welfare of drivers, mechanicians and other participants by developing and perfecting them in their profession and aiding them in securing adequate compensation for expertness to protect and aid them to secure prizes.

7—To schedule dates and places for speed contests and exhibitions.

8—To foster and encourage the engaging of foreign entrants.

N. A. C. C. Cross-Licensing Plans

(*Continued from page* 39)

able than the member's individual patents.

3—It will cement the industry together in a co-operative spirit which is in keeping with the tendency of the times.

4—There has been little or no money made out of patents in the automobile industry, and it is not likely that any money can be made out of patents by litigating them, as the winner in a patent lawsuit seldom receives very much.

5—Legitimate profit should come from proper manufacturing and selling of cars, and not from exploitation of patents which generally do not represent more than the incidental development of motor cars, for which engineers are generally responsible whether they take out patents or not.

6—The main thing is to establish a substantial business with patents only as a protection against patent litigation. Primarily, it should be the object to get business, as patents are merely incidental to business.

7—While everyone hopes to obtain good patents in the future it is apparent that the patents taken out by any one member are not likely to be as valuable to him as rights under patents taken out by 75 to 100 other members.

8—Each member will be left free to display his originality along the line of design patents.

9—The agreement is largely limited to chassis units and parts; that is to say, units and parts that are common to either trucks or motor vehicles primarily adapted to private passenger use. No attempt has been made to include undeveloped and rapidly evolving things such as loading and unloading devices, fire apparatus, tractors, etc.

10—It is an entirely new and original plan in line with the co-operative movement of the day, which has obtained in the automobile industry with better results than in any other field.

11—Equitable provision has been made to exclude and leave free for special consideration any basic or revolutionary patent of great value which may hereafter be developed within the organization of any member, thus encouraging a continued advance in the art but eliminating those patents of minor importance that are many times used for harassing purposes.

12—The plan requires the signature of sixty-one members owning at least 300 patents coming within the terms of the agreement before it becomes operative, which insures protection of the most substantial order for each manufacturer before he is required to grant any rights under his own patents.

300-Mile Race for Chicago Oct. 9

CHICAGO, ILL., June 29—*Special Telegram*—Encouraged over the success attendant upon the inaugural race run over their new track Saturday the directors of the Chicago speedway now are contemplating the promotion of another contest in the fall and have requested Chairman Kennerdell of the A. A. A. contest board to reserve Oct. 9, for such an event. According to present plans the fall race will be 300 miles in length and $25,000 will be hung up in prize money.

Maxwell Laboratory at Chicago Track

CHICAGO, ILL., June 28—Believing that the Chicago speedway offers unexcelled advantages for testing automobiles Ray Harroun, the former racing driver, who is now head of the engineering department of the Maxwell Motor Co., Detroit, has made arrangements to establish an engineering laboratory at the local track and this summer will try out all the new models on the 2-mile board oval.

Race Motors Behave Marvelously

(*Continued from page 7*)

That the smoothness of the board track had the effect of lessening the shocks to which the cars were subjected is undeniable, but shocks have only a little influence in motor reliability, although they play a big part in the lasting power of springs and axles. Perhaps the roughness of the Indianapolis brick might be blamed for the loosening of the magneto platform on Van Raalte's Sunbeam, but that is about the only motor trouble in the former race which could fairly be blamed to shock.

Stupendous Reliability

It is quite difficult at first to realize what the speed of this Chicago race really means. The tabulation of reliability given above is but a pale outline of a few of the things which together make the most wonderful demonstration of motor efficiency which the world has ever seen. Perhaps the casual observer is liable to give weight to the fact that the first and second cars were both of foreign origin, but anyone knowing to how great an extent small things outside the chassis construction play their part in race winning, will pay but little regard to who won, rather will he look to the whole ten who made more than the 90 miles an hour.

Take the Stutz case, for example. Here we had evidence of a speed capability, in Wilcox's car, at least equal to and perhaps in excess of that possessed by either the Peugeot or the Sunbeam and the two Stutzes which finished within 12 minutes of the winner, both had many tire stops. Out of this time Anderson spent nearly 7 minutes more than Resta on tires alone, so his car was only a minute an hour slower than Resta's.

The first three cars to finish used the Zenith carbureter and Oilzum was used for lubrication on the cars finishing first, third, fifth, sixth, seventh, eighth, ninth and tenth, or eight out of the ten prize winners.

Stutz Tire Troubles

Why the Stutz men were so unfortunate with tires remains a mystery up to the present, for they were using the same sort as their luckier brethren and using them under the same conditions. Possibly the cars were held a little lower down on the banking than the Peugeot or the Sunbeam but even John Palmer, inventor of the cord tire, is not prepared with any explanation as to the remarkable difference in tire reliability as between one car and another.

Still, to keep to the motors, at Indianapolis, the general idea was that in putting up a speed which represented the limit of the track, the limit of the motor had been reached as well. Chicago proves this is wrong so the present idea is rather that the faster and easier course brings us back to tires and human endurance once more. Had the Chicago race been for 300 instead of 500 miles it would undoubtedly have been won at well over 100 miles an hour.

Sixteen-Valve Motors

In a mechanical review of the happenings of a race it is generally possible to take instances of trouble or failure and therefrom to extract lessons of engineering interest. Concerning this race so little happened, there was so little trouble, that the arising question is, "How can we get more speed?" instead of "How can we maintain the speed set as a standard?"

Chicago sets the mark of the multi-valve motor, it shows the sixteen-valve, four-cylinder motor developed to an equal pitch by America, France and England. Carburetion has been got in hand, ignition difficulties are overcome, and aluminum-alloy pistons have established their place.

But in this review let us not forget Harry Grant's old Sunbeam, for this is no modern creation, but an old warrior among the veterans of the race track with an L-head motor, two valves per cylinder and none of the aids to power developed within the last 2 years. Grant made his show largely by knowing how fast he could drive without trouble, by knowing that he had gas and oil enough for the whole journey and by having good reason to trust in his tires. Perhaps the smoother torque of the six cylinders had something to do with his tire reliability, without a shadow of doubt, his steady speed without 100-mile-an-hour bursts had a great deal more to do with it. Probably his speed is the limit of which the car is capable but it is considerably higher than the manufacturers ever expected of it in a race as long as 500 miles.

Turning now to those which fell by the way the Ogren suffered a mishap which might be due to faulty material or to insufficiently strong design. An extraordinary sort of failure altogether. It was the fracture of the casing which holds the bevel pinion and its bearings, thus allowing the pinion to fall out of mesh with the ring gear. In such a case nothing could possibly be attempted.

Too Much Oil

The old Mercer reported that no spark could be kept going and investigation made by the writer with the aid of the Bosch representatives disclosed the fact that the pistons, whether from too large a tolerance or some other cause were allowing so much oil to pass that the plugs became literally filled up with it. No plug on earth could have sparked under such a smothering cloud of lubricant.

Wilcox's Stutz after making very high speed for quite a long time suffered a broken piston.

Of the Dusenbergs one burned out a connecting rod bearing, probably through momentary failure of the lubrication, or a tiny bit of dirt in the oil channel perhaps. The other suffered a derangement of the clutch which made gear changing impossible.

Lastly, Limberg's old Sunbeam, a sister car to Harry Grant's, burned a bearing or broke a connecting-rod bolt, causing some complications inside which resulted in a punctured crankcase. Investigation by pulling down the motor was not made on the spot but it might reasonably be supposed that an instant's pause in the oil supply to some bearing or other was the primary cause.

Sunbeam Bearing Trouble

Of the cars which were left running after the first ten were in, Van Raalte had a broken connecting-rod and had been running for a couple of hours on three cylinders. The piston or the connecting-road bearing seized, the rod broke, hit the piston and so bent it that it jammed in the cylinder mouth and the bits of rod then dropped harmlessly into the crankcase. A hole was punched in the side of the case during these events, but this did not matter because of the lubrication system. On the Sunbeams oil is sucked back to the tank directly it gets through the bearings and drops to the base, so the latter never contains any oil.

The two Maxwells which failed to get among the prize winners appeared simply to be insufficiently fast.

CAUSES OF RETIREMENT IN LAST THREE SPEEDWAY RACES

Indianapolis, 1914	Indianapolis, 1915	Chicago, 1915
Broken cam	Broken connecting rod.	Broken bevel pinion housing.
Broken connecting rod.	Broken timing gear	Broken piston.
Broken rocker arm	Broken piston	Broken connecting rod.
Broken piston	Broken connecting rod.	Burned out bearing.
Broken valve & piston.	Broken wheel	Oil on plugs.
Broken connecting rod.	Broken piston	Faulty clutch.
Broken valve	Broken rear axle bearing	
Broken wheel	Loose flywheel	
Broken camshaft		
Broken camshaft	Smoking exhaust	
Broken connecting rod.	Cranked cylinder	
Broken ball bearing	Loose mud pan	
Broken frame		
Loosened cylinder		
Per cent retirement caused by broken parts, 93	Per cent. retirement caused by broken parts, 64	Per cent. retirement caused by broken parts, 50

Globe Tire Adds—The Globe Rubber Tire Co., Trenton, N. J., will build a two-story brick addition to its plant on Prospect street.

To Mfg. Tractors—J. C. Kerst is having plans made for factory to manufacture motor-driven farm machinery in Springfield, Ill.

Xenia Rubber Buys New Plant—The Xenia Rubber Co., Xenia, Ohio, has purchased the mills of the Belden elevator, 2½ miles from that city.

Portage Tire Purchases Plant — The Portage Rubber Co., Barberton, O., has purchased the old plant of the American Strawboard Co. and will erect buildings costing $300,000.

To Make Bumpers—The American Automatic Save-A-Life Co., Washington, D. C., will construct a plant at Cameron, W. Va., for the manufacture of automobile accessories and bumpers.

To Mfr. Diesel Engines—The Enkel Motor Co., Auburn, N. Y., will erect a plant for the manufacture of the Diesel type of automobile motor. C. H. Williams is vice-president and general manager.

Lenox May Move.—There has been some talk that the Lenox Motor Car Co. of Hyde Park, Mass., might move to Lowell, Mass., in the near future, if sufficient inducements were held out by the latter city.

To Manufacture Accessories — The Furgason Mfg. Co., Lansing, Mich., has acquired a new plant and will add the manufacture of automobile accessories to its present line of general machine shop products.

To Make Tires—The Essex Tire Construction Co. has been incorporated to manufacture automobile tires with a capital stock of $125,000. The plant will be in Irvington, N. J. The incorporators are W. Barth, F. H. Butterthworth and F. M. Mervin.

Gordon Rubber to Add—The Gordon Rubber Co., Canton, Ohio, has increased its capital stock from $300,000 to $600,000 and has under consideration the erection of new buildings that will double the capacity of its plant.

Newark Co. to Make Carbureters—The Mfg. & Sales Co. of the Float-Jet carbureter, has been incorporated to make carbureters in Newark, N. J. The capital is $300,000 and the incorporators are Siegfried Leschinger, C. F. Kraemer and J. M. Reilly, all of Newark.

Kellogg to Increase — The Kellogg Mfg. Co. plant has been working in day and night shifts for the last three months to keep up with orders for its engine-driven tire pumps. Recently the company added 15,000 feet of floor space. Plans are prepared for a larger plant and equipment to be ready as needed.

Tire Co. in Conn.—The Monarch Stitched Tire Co., formed recently in Maine, has purchased the Munroe-Eastman Co.'s plant at the border line between Newington and New Britain, Conn., in which the company will manufacture its product. The carcass of the tire is both stitched and cemented into the tread, and a guarantee of 6,000 miles without the adjustment clause will be given by the makers.

Falls Motor Adds—The Falls Motor Co., Sheboygan Falls, Wis., manufacturer of gasoline engines for automobiles, is about to erect a large new testing shop building. The new shop will be of brick and steel, 45 by 154 ft. in size, with concrete floors. The present testing shop is being equipped with machinery for motor construction. Overtime operations have been in effect for some months and the plant is employing more men than at any other time since its establishment.

Hoover Steel Starts Building—The Hoover Steel Ball Co., Ann Arbor, Mich., has broken ground for an additional new building, which will be 40 by 313 ft. and is to be filled with ball-making machinery. This will make the third new building which the company has erected since Sept. 1, last year, and comprising over 29,000 sq. ft. of floor space. This will allow the company to increase its payroll to between 500 and 600 employees. The company has contracted for approximately $65,000 worth of additional ball-making machinery.

$100,000 Addition for Fedders—The Fedders Mfg. Co., Buffalo, N. Y., will spend $100,000 on a new four-story addition to its plant. When the new place is finished the floor space of the plant will be doubled. The offices, which are now in one of the old buildings, will be moved there and the space that they occupy at the present time will be added to the factory. Besides housing the offices it will include the service department. The new building is one story higher than the other buildings which comprise the plant. Brick and steel are the principal materials being used in its construction.

The Automobile Calendar

July 3.....Utica, N. Y., Hill Climb, Automobile Club of Utica.
July 3.....Sioux City, Ia., 300-Mile Race, Sioux City Speedway Assn.
July 3.....Westerville, O., Show.
July 4.....Visalia, Cal., Road Race; Tulare County Automobile Assn.
July 4-5.....Tacoma, Wash., Road Race, Tacoma Speedway Assn.
July 5.....Omaha, Neb., Speedway Races, Omaha Motor Speedway.
July 5.....Visalia, Cal., Road Race, Tulare Co. Auto. Assn.
July 7-8.....Taylor, Texas, Track Race, Taylor Automobile Club.
July 9.....Burlington, Ia., 100-Mile Track Race; Tri-State Fair.
Aug. ..... Milwaukee, Wis., Independent Petroleum Marketers' Assn. of the U. S.; 1915 Convention in Milwaukee.
Aug. 2-3..... San Francisco, Cal., Tri-State Good Roads Assn., Third Annual Convention.
Aug. 20-21.....Elgin, Ill., Road Races.
Sept. .....Indianapolis, Ind., Fall Show, Indiana State Fair.
Sept. .....Peoria, Ill., Second Northwestern Road Congress.
Sept. 3.....Columbus, O., Show, Ohio State Fair, Columbus Auto. Show Co.
Sept. 6.....Providence, R. I., Speedway Race; F. E. Perkins.
Sept. 6.....Detroit, Mich., Speedway Race; Detroit Speedway Club.
Sept. 8-11.....Hamline, Minn., 2-Day Meet at State Fair Grounds between Minneapolis and St. Paul, State Fair.
Sept. 13.....Oakland, Cal., Pan-American Road Congress.
Sept. 17-18.....Peoria, Ill., Illinois Garage Owners' Assn. Convention.
Sept. 20-25.....San Francisco, Cal., International Engineering Congress.
Sept. 18-25.....Los Angeles, Cal., Show, Shrine Auditorium.
Oct. .....St. Louis, Mo., Show, Forest Park Highlands, St. Louis Automobile Manufacturers and Dealers' Assn.
Oct. 1.....Minneapolis, Minn., Track Race, Twin City Motor Speedway Co.
Oct. 1-2.....Trenton, N. J., Track Races; Inter-State Fair.
Oct. 2.....New York City, Sheepshead Bay Motor Speedway Track Meet.
Oct. 6-16 .....New York City, Ninth Electrical Exposition and Motor Show at Grand Central Palace.
Oct. 11-12.....Dayton, O., National Paving Brick Manufacturers' Assn., Annual Meeting.
Nov. 18..... Arizona 150-mile Grand Prix.
Dec. 31..... New York City, Show; Grand Central Palace.
Jan. 22, 1916....Chicago, Ill., Show; Coliseum.
March 4-11.....Boston, Mass., Truck Show, Mechanics Bldg.

The Week in  the Industry

Miller Chalmers Assistant Sales Mgr.—H. W. Miller, formerly of Studebaker, has joined the Chalmers Motor Co., Detroit, Mich., in the capacity of assistant to the sales manager.

Suhr in Oregon—F. W. Suhr, special representative of the motor truck department of the Firestone Tire & Rubber Co., has been a visitor at the Portland (Ore.) branch for the past fortnight.

Wentworth Buys Out Portland Overland—Frank E. Wentworth, who is a partner of the Wentworth-Fosdick Co., Hupmobile distributors in Boston, and who has several other motor concerns in New England, has bought out the Overland branch in Portland, Ore., and in future it will be known as the F. E. Wentworth Corp. He has placed the agency in charge of E. A. Smith, who had charge of the Overland agency at Manchester, N. H., for some years. Salesrooms have been opened at the corner of Park and Congress Streets, and Mr. Wentworth had to give an order for 1000 Overlands to get the business.

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Garage

N. Y. Co. Moves—The Bryant Motor Service Co. has moved into larger quarters at 1926 Broadway, New York City.

McNaull Tire Opens in Brooklyn—The McNaull Tire Co. has opened a branch in Brooklyn, N. Y., at 1246 Bedford Avenue, under the management of W. H. Byrnes.

Falls Tire in Seattle—H. H. Hazeltine and A. W. Hoppock are joint owners of the Seattle Tire & Rubber Co., 1624 Broadway, Seattle, Wash., representing the Falls tire.

Auto Utilities in N. Y.—The Auto Utilities Corp. has opened a salesroom at 1898 Broadway, New York City, for the sale of Disco electric lighting and engine starting equipment.

N. Y. Kissel Moves—Clodio & Engs, Metropolitan Kissel distributor, has moved into larger quarters in the new Circle Building, Central Park West and Sixty-first Street, New York City.

Toledo Garage Moves—The United Garage Co., Toledo, Ohio, will move Sept. 1 to larger quarters at Jefferson and Ontario Streets. M. R. Himes, manager of the concern, has taken a 20-year lease on the structure. The building is fireproof and will be equipped throughout with a sprinkler system.

Motor Men in New Roles

Halladay Resigns—C. L. Halladay has resigned as chief engineer and factory manager of the Lewis Spring & Axle Co., Jackson, Mich.

Emerson King Purchasing Agent—J. R. Emerson has been appointed purchasing agent for the King Motor Car Co., Detroit, Mich.

Chamberlain Garford Mgr.—R. E. Chamberlain is the manager of the Kansas City branch of the Garford Motor Truck Co., Lima, Ohio.

Bonniwell Assistant Advertising Mgr.—C. A. Bonniwell has been appointed assistant sales and advertising manager of the Auburn Automobile Co., Auburn, Ind.

Hobbs With Hoyt in Detroit—E. M. Hobbs has been appointed district sales manager of the Hoyt Electrical Instrument Works, Penacook, N. H., with headquarters at 967½ Woodward Avenue, Detroit.

Wayne's Temporary Officers—Temporary officers have been named by the Wayne Steering Wheel & Box Co. They are: J. C. Coleman, sales manager; Anthony Snyder, treasurer, and W. M. Wetherell, factory manager.

Tormey Frisco Tire Mgr.—James Tormey, formerly with the San Francisco branch of the Goodyear Tire & Rubber Co., is the new manager of the Service Tire and Oil Co., San Francisco, Cal., distributor for Nassau tires.

Hardin St. Louis Dealers' Secretary—W. O. Hardin has been made secretary of the St. Louis Automobile Manufacturers' and Dealers' Assn., succeeding P. J. Fisher, who has resigned. Hardin will assume his new duties July 1.

Dunham in Garfield Bldg.—G. W. Dunham, formerly vice-president and consulting engineer of the Chalmers Motor Co., who resigned to start into business for himself as a consulting engineer, has located his offices in the Garfield Bldg., Woodward Avenue, Detroit.

Jennings Dodge District Rep.—C. H. Jennings has been appointed district representative for Dodge Bros. in New York City. Mr. Jennings has been actively in charge since C. W. Matheson, formerly New York district man, became service director of Dodge Bros. several months ago.

See Winnipeg Mgr.—The Dominion Auto Supply Co. has been formed in Winnipeg under the management of G. W. See. This new concern has taken over the premises recently vacated by the Western Canada Motor Car Co., and will conduct a general garage and supply business.

Rengers Assistant to Pres.—F. H. Rengers in becoming the assistant to J. W. Moon takes charge of the correspondence department of the Moon Motor Car Co., and inside work and office work of an assistant nature to Mr. Moon. Mr. Rengers succeeds C. C. Culbertson to this position.

Colgrove Gets Hudson for Grand Rapids—L. E. Colgrove, who has been manager for the Mitchell Motor Sales Co., Grand Rapids, Mich., has become Hudson dealer in that city. He has secured quarters in the Burton A. Spring garage on Jefferson Avenue and will maintain salesrooms and a service station.

Jenkins Returns to Coast—W. M. Jenkins, who has been sales manager of the Master Carbureter Corp. since this concern was started in Detroit, Mich., last year, has returned to the Pacific Coast to take charge of the sales of the Master Carbureter Co., Ltd., Los Angeles, Cal. The business of the Detroit concern is now conducted from the new plant at 1523 Fort Street, West.

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Dealer

N. Y. Remington Makes Lease—The Remington Motor Sales Corp. has leased offices in the United States Rubber Bldg., Broadway and Fifty-eighth Street, New York City.

Opens Seattle Repair Shop—H. V. Hoffman, formerly with the Buick in Seattle, Wash., has opened a repair shop and storage plant at 5322 Rainier Avenue, Seattle.

N. Y. Federal Truck Enlarges—The present quarters of the Federal Truck Co. in New York City have been found inadequate. Arrangements have been made to secure the whole second-floor space at 146 West Fifty-second Street, the company at present occupying the first floor. The first floor will be entirely devoted to service quarters, garage and repair shop, with an entrance directly off the street. The whole second floor is given over to showroom, general offices and sales department, together with a department for spare parts. The company has established a station in Newark, N. J., at 985-987 Broad Street.